DELAWARE STATE UNIVERSITY
CONTRACT # FD-15-059

SPECIFICATIONS
FOR

Campus-wide ADA Railing and Ramp Modifications

IN

East Dover Hundred - Kent County
Dover, Delaware

PREPARED
BY

Moto Designshop

ISSUED FOR BID
April, 12 2016

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INVITATION TO BID

Sealed bids for Delaware State University Contract No. **FD-15-059 – Campus-wide ADA Railing & Ramp Modifications** will be received by the Delaware State University, in the reception area of the Purchasing Office in the Administration Building, 1200 N. DuPont Highway, Dover, DE 19901-2277 (Third Floor), until **3:00 pm** local time on **Thursday, May 19 2016,** at which time they will be publicly opened and read aloud in the Conference Room. Bidder bears the risk of late delivery. Any bids received after the stated time will be returned unopened.

Project involve: It is the intent of Delaware State University to select qualified contractor to perform various modifications to the ramps and railings throughout the main campus to meet ADA standards.

A **MANDATORY** Pre-Bid Meeting will be held on **Wednesday, May 04, 2016** at **1:30 pm** at **the Facilities Building** for the purpose of establishing the listing of subcontractors and to answer questions. Representatives of each party to any Joint Venture must attend this meeting. **ATTENDANCE OF THIS MEETING IS A PREREQUISITE FOR BIDDING ON THIS CONTRACT.**

Sealed bids shall be addressed to the Delaware State University c/o the Purchasing Department, Administration Building, Room 321 (Third Floor), Dover, DE 19901-2277, Attn: Zafar Chaudhry, Associate Vice President of Contract & Procurement. The outer envelope should clearly indicate: **"DSU CONTRACT NO. FD-15-059 – Campus-wide ADA Railing & Ramp Modifications - SEALED BID - DO NOT OPEN."**

Contract documents may be obtained or reviewed at the office of Moto Design Shop located at 222 Vine Street, Philadelphia, PA 19106 upon receipt of $500.00 per set/non-refundable, starting on the day of the mandatory pre-bid. Checks are to be made payable to Moto Design Shop. Alternatively, in consideration of our environment, and in alignment with the University's sustainability initiatives, bidders may request an electronic copy of the bidding documents by submitting a written request to constructionbid@desu.edu. Delaware State University will track all bidders and ensure plan holder receive all addenda.

Summary of Events and Dates:

Wednesday, May 04, 2016	**Mandatory Site Visit at the Facilities Building at (1:30PM EST)**
Monday, May 16, 2016	**Deadline for Questions (4:00PM EST)**
Tuesday, May 17, 2016	**Posting of Answers to Contractor Questions (4:00PM EST)**
Tuesday, May 17, 2016	**Final Date for Addendums**
Thursday, May 19, 2016	**Proposals Due (3:00 PM EST)**
Thursday, May 26, 2016	**Contractor Selection Date**
Monday, June 06, 2016	**Anticipated Start of Construction Date (subject to change)**
Monday, June 20, 2016	**Latest Date for Contract Award**
August 31, 2016	**Substantial Completion**

Bidders will not be subject to discrimination on the basis of race, creed, color, sex, sexual orientation, gender identity or national origin in consideration of this award, and Minority Business Enterprises, Disadvantaged Business Enterprises, Women-Owned Business Enterprises and Veteran-Owned Business Enterprises will be afforded full opportunity to submit bids on this contract. Each bid must be accompanied by a bid security equivalent to ten percent of the bid amount and all additive alternates. The successful bidder must post a performance bond and payment bond in a sum equal to 100 percent of the contract price upon execution of the contract. Delaware State University reserves the right to

reject any or all bids and to waive any informalities therein. Delaware State University may extend the time and place for the opening of the bids from that described in the advertisement, with not less than two calendar days' notice by certified delivery, facsimile machine or other electronic means to those bidders receiving plans.

DRUG TESTING REQUIREMENTS FOR LARGE PUBLIC WORKS

Pursuant to 29 Del.C. §6908(a)(6), effective as of January 1, 2016, OMB has established regulations that require Contractors and Subcontractors to implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds. The regulations establish the mechanism, standards and requirements of a Mandatory Drug Testing Program that will be incorporated by reference into all Large Public Works Contracts awarded pursuant to 29 Del.C. §6962. Final publication of the identified regulations can be found at the following: 4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects

END OF ADVERTISEMENT FOR BIDS

INSTRUCTIONS TO BIDDERS

TABLE OF ARTICLES

ARTICLE 1: GENERAL

1.1 DEFINITIONS

1.1.1 Whenever the following terms are used, their intent and meaning shall be interpreted as follows:

1.2 STATE: The State of Delaware.

1.3 BOARD: The Delaware State University Board of Trustees

1.4 UNIVERSITY: The Delaware State University

1.5 AGENCY: The Delaware State University

1.6 DESIGNATED OFFICIAL: The agent authorized to act for the Agency.

1.7 BIDDING DOCUMENTS: Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement for Bid, Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the Bid Form (including the Non-collusion Statement), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, as well as the Drawings, Specifications (Project Manual) and all Addenda issued prior to execution of the Contract.

1.8 CONTRACT DOCUMENTS: The Contract Documents consist of the, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the form of agreement between the Owner and the Contractor, Drawings (if any), Specifications (Project Manual), and all addenda.

1.9 AGREEMENT: The form of the Agreement shall be AIA Document A101, Standard Form of Agreement between Owner and Contractor where the basis of payment is a STIPULATED SUM. In the case of conflict between the instructions contained therein and the General Requirements herein, these General Requirements shall prevail.

1.10 GENERAL REQUIREMENTS (or CONDITIONS): General Requirements (or conditions) are instructions pertaining to the Bidding Documents and to contracts in general. They contain, in summary, requirements of laws of the State; policies of the Agency and instructions to bidders.

1.11 SPECIAL PROVISIONS: Special Provisions are specific conditions or requirements peculiar to the bidding documents and to the contract under consideration and are supplemental to the General Requirements. Should the Special Provisions conflict with the General Requirements, the Special Provisions shall prevail.

1.12 ADDENDA: Written or graphic instruments issued by the Owner/Architect prior to the execution of the contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

1.13 BIDDER OR VENDOR: A person or entity who formally submits a Bid for the material or Work contemplated, acting directly or through a duly authorized representative who meets the requirements set forth in the Bidding Documents.

1.14 SUB-BIDDER: A person or entity who submits a Bid to a Bidder for materials or labor, or both for a portion of the Work.

1.15 BID: A complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.16 BASE BID: The sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids (if any are required to be stated in the bid).

1.17 ALTERNATE BID (or ALTERNATE): An amount stated in the Bid, where applicable, to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents is accepted.

1.18 UNIT PRICE: An amount stated in the Bid, where applicable, as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

1.19 SURETY: The corporate body which is bound with and for the Contract, or which is liable, and which engages to be responsible for the Contractor's payments of all debts pertaining to and for his acceptable performance of the Work for which he has contracted.

1.20 BIDDER'S DEPOSIT: The security designated in the Bid to be furnished by the Bidder as a guaranty of good faith to enter into a contract with the Agency if the Work to be performed or the material or equipment to be furnished is awarded to him.

1.21 CONTRACT: The written agreement covering the furnishing and delivery of material or work to be performed.

1.22 CONTRACTOR: Any individual, firm or corporation with whom a contract is made by the Agency.

1.23 SUBCONTRACTOR: An individual, partnership or corporation which has a direct contract with a contractor to furnish labor and materials at the job site, or to perform construction labor and furnish material in connection with such labor at the job site.

1.24 CONTRACT BOND: The approved form of security furnished by the contractor and his surety as a guaranty of good faith on the part of the contractor to execute the work in accordance with the terms of the contract.

1.25 LIQUIDATED DAMAGES: An amount due and payable to the University by the Contractor for additional costs incurred by the University resulting from the Contractor's failure to complete within the Contract time.

ARTICLE 2: BIDDER'S REPRESENTATIONS

2.1 PRE-BID MEETING

2.1.1 A pre-bid meeting for this project will be held at the time and place designated. Attendance at this meeting is a pre-requisite for submitting a Bid, unless this requirement is specifically waived elsewhere in the Bid Documents.

2.2 By submitting a Bid, the Bidder represents that:

2.2.1 The Bidder has read and understands the Bidding Documents and that the Bid is made in accordance therewith.

2.2.2 The Bidder has visited the site, become familiar with existing conditions under which the Work is to be performed, and has correlated the Bidder's his personal observations with the requirements of the proposed Contract Documents.

2.2.3 The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

2.3 JOINT VENTURE REQUIREMENTS

2.3.1 For Public Works Contracts, each Joint Venturer shall be qualified and capable to complete the Work with their own forces.

2.3.2 Included with the Bid submission, and as a requirement to bid, a copy of the executed Joint Venture Agreement shall be submitted and signed by all Joint Venturers involved.

2.3.3 All required Bid Bonds, Performance Bonds, Material and Labor Payment Bonds must be executed by both Joint Venturers and be placed in both of their names.

2.3.4 All required insurance certificates shall name both Joint Venturers.

2.3.5 Both Joint Venturers shall sign the Bid Form and shall submit a copy of a valid Delaware Business License with their Bid.

2.3.6 Both Joint Venturers shall include their Federal E.I. Number with the Bid.

2.3.7 In the event of a mandatory Pre-bid Meeting, each Joint Venturer shall have a representative in attendance.

2.3.8 Due to exceptional circumstances and for good cause shown, one or more of these provisions may be waived at the discretion of the State.

2.4 ASSIGNMENT OF ANTITRUST CLAIMS

2.4.1 As consideration for the award and execution by the Owner of this contract, the Contractor hereby grants, conveys, sells, assigns and transfers to the State of Delaware all of its right, title and interests in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, relating to the particular goods or services purchased or acquired by the Owner pursuant to this contract.

ARTICLE 3: BIDDING DOCUMENTS

3.1 COPIES OF BID DOCUMENTS

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the Architectural/Engineering firm designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein.

3.1.2 Bidders shall use complete sets of Bidding Documents for preparation of Bids. The issuing Agency nor the Architect assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.1.3 Any errors, inconsistencies or omissions discovered shall be reported to the Architect immediately.

3.1.4 The Agency and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall report any errors, inconsistencies, or ambiguities discovered to the Architect.

3.2.2 Bidders or Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect at least seven days prior to the date for receipt of Bids. Interpretations,

corrections and changes to the Bidding Documents will be made by written Addendum. Interpretations, corrections, or changes to the Bidding Documents made in any other manner shall not be binding.

3.2.3 The apparent silence of the specifications as to any detail, or the apparent omission from it of detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and only material and workmanship of the first quality are to be used. Proof of specification compliance will be the responsibility of the Bidder.

3.2.4 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all permits, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

3.2.5 The Owner will bear the costs for all impact and user fees associated with the project.

3.3 SUBSTITUTIONS

3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of quality, required function, dimension, and appearance to be met by any proposed substitution. The specification of a particular manufacturer or model number is not intended to be proprietary in any way. Substitutions of products for those named will be considered, providing that the Vendor certifies that the function, quality, and performance characteristics of the material offered is equal or superior to that specified. It shall be the Bidder's responsibility to assure that the proposed substitution will not affect the intent of the design, and to make any installation modifications required to accommodate the substitution.

3.3.2 Requests for substitutions shall be made in writing to the Architect at least ten days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect’s decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.

3.3.3 If the Architect approves a substitution prior to the receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding.

3.3.4 The Architect shall have no obligation to consider any substitutions after the Contract award.

3.4 ADDENDA

3.4.1 Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of the Bidding Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

3.4.3 No Addenda will be issued later than 4 days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of bids.

3.4.4 Each bidder shall ascertain prior to submitting his Bid that they have received all Addenda issued, and shall acknowledge their receipt in their Bid in the appropriate space. Not acknowledging an issued Addenda could be grounds for determining a bid to be non-responsive.

ARTICLE 4: BIDDING PROCEDURES

4.1 PREPARATION OF BIDS

4.1.1 Submit the bids on the Bid Forms included with the Bidding Documents.

4.1.2 Submit the original Bid Form for each bid. Bid Forms may be removed from the project manual for this purpose.

4.1.3 Execute all blanks on the Bid Form in a non-erasable medium (typewriter or manually in ink).

4.1.4 Where so indicated by the makeup on the Bid Form, express sums in both words and figures, in case of discrepancy between the two, the written amount shall govern.

4.1.5 Interlineations, alterations or erasures must be initialed by the signer of the Bid.

4.1.6 BID ALL REQUESTED ALTERNATES AND UNIT PRICES, IF ANY. If there is no change in the Base Bid for an Alternate, enter “No Change”. The Contractor is responsible for verifying that they have received all addenda issued during the bidding period. Work required by Addenda shall automatically become part of the Contract.

4.1.7 Make no additional stipulations on the Bid Form and do not qualify the Bid in any other manner.

4.1.8 Each copy of the Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any legal entity, and each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current Power of Attorney attached, certifying agent's authority to bind the Bidder.

4.1.9 Bidder shall complete the Non-Collusion Statement form included with the Bid Forms and include it with their Bid.

4.1.10 In the construction of all Public Works projects for the State of Delaware or any agency thereof, preference in employment of laborers, workers or mechanics shall be given to bona fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State.

4.1.11 Each bidder shall include in their bid a copy of a valid Delaware Business License.’

4.1.12 Each bidder shall include signed Affidavit(s) for the Bidder and each listed Subcontractor certifying compliance with OMB Regulation 4104- “Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on “Large Public Works Projects.” “Large Public Works” is based upon the current threshold required for bidding Public Works as set by the Purchasing and Contracting Advisory Council.

4.2 BID SECURITY

4.2.1 All bids shall be accompanied by a deposit of either a good and sufficient bond to the agency for the benefit of the agency, with corporate surety authorized to do business in this State, the form of the bond and the surety to be approved by the agency, or a security of the bidder assigned to the agency, for a sum equal to at least 10% of the bid plus all add alternates, or in lieu of the bid bond a security deposit in the form of a certified check, bank treasurer’s check, cashier’s check, money order, or other prior approved secured deposit assigned to the State. The bid bond need not be for a specific sum, but may be stated to be for a sum equal to 10% of the bid plus all add alternates to which it relates and not to exceed a certain stated sum, if said sum is equal to at least 10% of the bid. The Bid Bond form used shall be the standard OMB form (attached).

4.2.2 The Agency has the right to retain the bid security of Bidders to whom an award is being considered until either a formal contract has been executed and bonds have been furnished or the specified time has elapsed so the Bids may be withdrawn or all Bids have been rejected.

4.2.3 In the event of any successful Bidder refusing or neglecting to execute a formal contract and bond within 20 days of the awarding of the contract, the bid bond or security deposited by the successful bidder shall be forfeited.

4.3 SUBCONTRACTOR LIST

4.3.1 As required by Delaware Code, Title 29, section 6962(d)(10)b, each Bidder shall submit with their Bid a completed List of Sub-Contractors included with the Bid Form. NAME ONLY ONE SUBCONTRACTOR FOR EACH TRADE. A Bid will be considered non-responsive unless the completed list is included.

4.3.2 Provide the Name and Address for each listed subcontractor. Addresses by City, Town or Locality, plus State, will be acceptable.

4.3.3 It is the responsibility of the Contractor to ensure that their Subcontractors are in compliance with the provisions of this law. Also, if a Contractor elects to list themselves as a Subcontractor for any category, they must specifically name themselves on the Bid Form and be able to document their capability to act as Subcontractor in that category in accordance with this law.

4.4 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

4.4.1 During the performance of this contract, the contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, sex, color, sexual orientation, gender identity or national origin. The Contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, creed, sex, color, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, sex, color, sexual orientation, gender identity or national origin."

4.5 PREVAILING WAGE REQUIREMENT

4.5.1 Wage Provisions: In accordance with Delaware Code, Title 29, Section 6960, renovation projects whose total cost shall exceed $15,000, and $100,000 for new construction, the minimum wage rates for various classes of laborers and mechanics shall be as determined by the Department of Labor, Division of Industrial Affairs of the State of Delaware.

4.5.2 The prevailing wage shall be the wage paid to a majority of employees performing similar work as reported in the Department's annual prevailing wage survey or in the absence of a majority, the average paid to all employees reported.

4.5.3 The employer shall pay all mechanics and labors employed directly upon the site of work, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics.

4.5.4 The scale of the wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work.

4.5.5 Every contract based upon these specifications shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly. The Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll.

4.6 SUBMISSION OF BIDS

4.6.1 Enclose the Bid, the Bid Security, and any other documents required to be submitted with the Bid in a sealed opaque envelope. Address the envelope to the party receiving the Bids. Identify with the project name, project number, and the Bidder's name and address. If the Bid is sent by mail, enclose the sealed envelope in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof. The State is not responsible for the opening of bids prior to bid opening date and time that are not properly marked.

4.6.2 Deposit Bids at the designated location prior to the time and date for receipt of bids indicated in the Advertisement for Bids. Bids received after the time and date for receipt of bids will be marked “LATE BID” and returned.

4.6.3 Bidder assumes full responsibility for timely delivery at location designated for receipt of bids.

4.6.4 Oral, telephonic or telegraphic bids are invalid and will not receive consideration.

4.6.5 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids, provided that they are then fully in compliance with these Instructions to Bidders.

4.7 MODIFICATION OR WITHDRAW OF BIDS

4.7.1 Prior to the closing date for receipt of Bids, a Bidder may withdraw a Bid by personal request and by showing proper identification to the Architect. A request for withdraw by letter or fax, if the Architect is notified in writing prior to receipt of fax, is acceptable. A fax directing a modification in the bid price will render the Bid informal, causing it to be ineligible for consideration of award. Telephone directives for modification of the bid price shall not be permitted and will have no bearing on the submitted proposal in any manner.

4.7.2 Bidders submitting Bids that are late shall be notified as soon as practicable and the bid shall be returned.

4.7.3 A Bid may not be modified, withdrawn or canceled by the Bidder during a thirty (30) day period following the time and date designated for the receipt and opening of Bids, and Bidder so agrees in submitting their Bid. Bids shall be binding for 30 days after the date of the Bid opening.

ARTICLE 5: CONSIDERATION OF BIDS

5.1 OPENING/REJECTION OF BIDS

5.1.1 Unless otherwise stated, Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids will be made available to Bidders.

5.1.2 The Agency shall have the right to reject any and all Bids. A Bid not accompanied by a required Bid Security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

5.1.3 If the Bids are rejected, it will be done within thirty (30) calendar day of the Bid opening.

5.2 COMPARISON OF BIDS

5.2.1 After the Bids have been opened and read, the bid prices will be compared and the result of such comparisons will be made available to the public. Comparisons of the Bids may be based on the Base

Bid plus desired Alternates. The Agency shall have the right to accept Alternates in any order or combination.

5.2.2 The Agency reserves the right to waive technicalities, to reject any or all Bids, or any portion thereof, to advertise for new Bids, to proceed to do the Work otherwise, or to abandon the Work, if in the judgment of the Agency or its agent(s), it is in the best interest of the State.

5.2.3 An increase or decrease in the quantity for any item is not sufficient grounds for an increase or decrease in the Unit Price.

5.2.4 The prices quoted are to be those for which the material will be furnished F.O.B. Job Site and include all charges that may be imposed during the period of the Contract.

5.2.5 No qualifying letter or statements in or attached to the Bid, or separate discounts will be considered in determining the low Bid except as may be otherwise herein noted. Cash or separate discounts should be computed and incorporated into Unit Bid Price(s).

5.3 DISQUALIFICATION OF BIDDERS

5.3.1 An agency shall determine that each Bidder on any Public Works Contract is responsible before awarding the Contract. Factors to be considered in determining the responsibility of a Bidder include:

A. The Bidder's financial, physical, personnel or other resources including Subcontracts;

B. The Bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or admission of violations of the Prevailing Wage Laws in Delaware or any other state;

C. The Bidder's written safety plan;

D. Whether the Bidder is qualified legally to contract with the State;

E. Whether the Bidder supplied all necessary information concerning its responsibility; and,

F. Any other specific criteria for a particular procurement, which an agency may establish; provided however, that, the criteria be set forth in the Invitation to Bid and is otherwise in conformity with State and/or Federal law.

5.3.2 If an agency determines that a Bidder is nonresponsive and/or nonresponsible, the determination shall be in writing and set forth the basis for the determination. A copy of the determination shall be sent to the affected Bidder within five (5) working days of said determination.

5.3.3 In addition, any one or more of the following causes may be considered as sufficient for the disqualification of a Bidder and the rejection of their Bid or Bids.

5.3.3.1 More than one Bid for the same Contract from an individual, firm or corporation under the same or different names.

5.3.3.2 Evidence of collusion among Bidders.

5.3.3.3 Unsatisfactory performance record as evidenced by past experience.

5.3.3.4 If the Unit Prices are obviously unbalanced either in excess or below reasonable cost analysis values.

5.3.3.5 If there are any unauthorized additions, interlineation, conditional or alternate bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite or ambiguous as to its meaning.

5.3.3.6 If the Bid is not accompanied by the required Bid Security and other data required by the Bidding Documents.

5.3.3.7 If any exceptions or qualifications of the Bid are noted on the Bid Form.

5.4 ACCEPTANCE OF BID AND AWARD OF CONTRACT

5.4.1 A formal Contract shall be executed with the successful Bidder within twenty (20) calendar days after the award of the Contract.

5.4.2 Per Section 6962(d)(13) a., Title 29, Delaware Code, "The contracting agency shall award any public works contract within thirty (30) days of the bid opening to the lowest responsive and responsible Bidder, unless the Agency elects to award on the basis of best value, in which case the election to award on the basis of best value shall be stated in the Invitation To Bid."

5.4.3 Each Bid on any Public Works Contract must be deemed responsive by the Agency to be considered for award. A responsive Bid shall conform in all material respects to the requirements and criteria set forth in the Contract Documents and specifications.

5.4.4 The Agency shall have the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid, plus accepted Alternates.

5.4.5 The successful Bidder shall execute a formal contract, submit the required Insurance Certificate, and furnish good and sufficient bonds, unless specifically waived in the General Requirements, in accordance with the General Requirement, within twenty (20) days of official notice of contract award. Bonds shall be for the benefit of the Agency with surety in the amount of 100% of the total contract award. Said Bonds shall be conditioned upon the faithful performance of the contract. Bonds shall remain in affect for period of one year after the date of substantial completion.

5.4.6 If the successful Bidder fails to execute the required Contract and Bond, as aforesaid, within twenty (20) calendar days after the date of official Notice of the Award of the Contract, their Bid guaranty shall immediately be taken and become the property of the State for the benefit of the Agency as liquidated damages, and not as a forfeiture or as a penalty. Award will then be made to the next lowest qualified Bidder of the Work or readvertised, as the Agency may decide.

5.4.7 Each bidder shall supply with its bid its taxpayer identification number (i.e., federal employer identification number or social security number) and a copy of its Delaware business license, and should the vendor be awarded a contract, such vendor shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

5.4.8 The Bid Security shall be returned to the successful Bidder upon the execution of the formal contract. The Bid Securities of unsuccessful bidders shall be returned within thirty (30) calendar days after the opening of the Bids.

ARTICLE 6: POST-BID INFORMATION

6.1 CONTRACTOR'S QUALIFICATION STATEMENT

6.1.1 Bidders to whom award of a Contract is under consideration shall, if requested by the Agency, submit a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a statement has been previously required and submitted.

6.2 BUSINESS DESIGNATION FORM

6.2.1 Successful bidder shall be required to accurately complete an Office of Management and Budget Business Designation Form for Subcontractors.

ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

7.1.1 The cost of furnishing the required Bonds, that are stipulated in the Bidding Documents, shall be included in the Bid.

7.1.2 If the Bidder is required by the Agency to secure a bond from other than the Bidder's usual sources, changes in cost will be adjusted as provide in the Contract Documents.

7.1.3 The Performance and Payment Bond forms used shall be the standard OMB forms (attached).

7.2 TIME OF DELIVERY AND FORM OF BONDS

7.2.1 The bonds shall be dated on or after the date of the Contract.

7.2.2 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a certified and current copy of the power of attorney.

ARTICLE 8: FORM OF AGREEMENT BETWEEN AGENCY AND CONTRACTOR

8.1 Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum.

ARTICLE 9: LIQUIDATED DAMAGES

9.1 Schedule of Liquidated Damages:

Schedule of Liquidated Damages		
Awarded Contract Value		Daily Charge
For Greater Than	Up to and Including	Calendar Day
$0.00	$25,000.00	$290.00
$25,000.00	$50,000.00	$300.00
$50,000.00	$100,000.00	$400.00
$100,000.00	$500,000.00	$630.00
$500,000.00	$1,000,000.00	$820.00
$1,000,000.00	$2,000,000.00	$1,000.00
$2,000,000.00	$5,000,000.00	$1,060.00
$5,000,000.00	$10,000,000.00	$1,180.00
$10,000,000.00	$15,000,000.00	$1,870.00

$15,000,000.00	$20,000,000.00	$3,130.00
$20,000,000.00	Over	$4,360.00

9.2 For each calendar day or work day that work remains uncompleted after the Contract time has expired or beyond the completion date established by the Contract, the sum specified in paragraph 9.1 of this document, will be deducted from any money due the Contractor. This sum shall not be considered and treated as a penalty but as liquidated damages due the University by reason of inconvenience to the public, added cost of engineering and supervision, and other extra expenditures of public funds due to the Contractor's failure to complete the work on time. Any adjustment of the Contract time for completion of the work granted by the University will be considered in the assessment of liquidated damages.

END OF SECTION 00 21 13

BID FORM

Project: FD-15-059 – Campus-wide ADA Railing & Ramp Modifications

Location: Delaware State University
Main Campus
1200 North DuPont Hwy
Dover, Delaware

For Bids Due: Thursday, May 19, 2016 at 3:00 PM
To: Delaware State University
Administration Bldg,
Purchasing, Room 321
1200 N. DuPont Highway
Dover, DE 19901-2277
Attn: Zafar Chaudhry
Associate Vice President of Contract and Procurement

Name of Bidder: _____

Delaware Business License No.:_____ **Taxpayer ID No.:** _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

(Other License Nos.): _____

Phone No.: ( ) _____ - _____ **Fax No.: ( ) _____ - _____**

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____(Written Out).

($_____) (Figures).

[This price includes all allowances as documented within the project manual.]

A. ALTERNATES (Note: *project is subject to prevailing wages*)

1. Alternates: Alternate prices conform to applicable project specification section. Refer to the drawing specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossing out the part that does not apply.
   a. **Alternate #1:** Net - ADD / DEDUCT

- _____ (Figures).
- _____ (Written Out).

b. **Alternate #2:** Net - ADD / DEDUCT

- _____ (Figures).
- _____ (Written Out).

c. **Alternate #3:** Net - ADD / DEDUCT

- _____ (Figures).
- _____ (Written Out).

B. UNIT PRICES

1. Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

	ADD	**DEDUCT**
UNIT PRICE No. 1: (BRIEF DESCRIPTION)	$ _____	$ _____
UNIT PRICE No. 2: (BRIEF DESCRIPTION)	$ _____	$ _____
UNIT PRICE No. 3: (BRIEF DESCRIPTION)	$ _____	$ _____

C. WORK SCHEDULE

1. We understand that this contract is governed by liquidated damages and that submission of this bid is acceptance of the proposed contract completion date. Our proposed detailed project schedule shows more fully the sequence of activities necessary to meet the specified schedule. The project schedule is a required attachment of a complete bid and failure to submit a viable schedule will be a justifiable reason to deem the bid as incomplete.

2. I/We can begin work _____ calendar days after notification of award and will require _____ calendar days thereafter to complete the work. Work on the project will begin _____ calendar days after Letter of Intent.

3. Alternative Work Hours

   Work during “regular hours” at this site is being performed on a single shift, eight hours per day, 7:30 AM to 4:30 PM, and five days per week, Monday through Friday. To meet the schedule established on the basis of Item 1 above, our proposed work hours will be ____ hours per day, _____ AM to _____ PM, and _____ days per week, _____ through _____ the cost of which is reflected in our lump sum price. Our lump sum price also includes any mandatory off-hours work required per special conditions.

D. SITE SUPERINTENDANT

We propose to use _____ as our site superintendent. A resume of his/her qualifications is attached.

We understand that DSU reserves the right to interview him/her prior to contract award/prior to start of work and to reject him/her if not considered acceptable. If rejected, we will propose alternate personnel for the position who will be subject to the same review and acceptance procedure, at no increase in our lump sum proposal.

We also understand DSU reserves the right to reject our bid if we are unable to provide a site supervisor acceptable to DSU within thirty (30) calendar days after submission of this bid.

E. REMARKS

1. I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

2. This bid shall remain valid and cannot be withdrawn for thirty (30) days from the date of opening of bids (60 days for School Districts and Department of Education), and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

3. The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

4. This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

5. Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _____calendar days of the Notice to Proceed.

6. Our Bid Price(s) are firm based on contract award within thirty (30) calendar days of the date of submittal of this bid.

7. I/We understand that we will not be compensated at a later date for claimed additional costs based on any information received during the bid period, but which is not identified in our proposal and subsequently accepted in writing by DSU.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ **By:** _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Security
Construction Schedule
Resume of Site Superintendent
(Others as Required by Project Manuals)

END OF SECTION 00 41 13

STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____ _____of _____ in the County of _____ and State of _____as **Principal**, and _____ _____ of _____ in the County of _____ and State of _____ as **Surety**, legally authorized to do business in the State of Delaware ("**State**"), are held and firmly unto the **State** in the sum of _____ Dollars ($_____), or _____ percent not to exceed _____ _____ Dollars ($_____) of amount of bid on Contract No. _____, to be paid to the **State** for the use and benefit of _____ (***insert State agency name***) for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded **Principal** who has submitted to the _____ (***insert State agency name***) a certain proposal to enter into this contract for the furnishing of certain material and/or services within the **State**, shall be awarded this Contract, and if said **Principal** shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the _____ (***insert State agency name***) this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____ seal and dated this _____day of _____ in the year of our Lord two thousand and _____ (20___).

SEALED, AND DELIVERED IN THE
Presence of

_____
Name of Bidder (Organization)

Corporate Seal

By: _____
Authorized Signature

Attest _____

_____
Title

_____
Name of Surety

Witness:_____ By: _____

_____
Title

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor **must be listed for each category** where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the *Owner*, **it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.**

Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax payer ID # or Delaware Business license #
1. Demolition			
2. Painting			
3. Masonry			
4. Iron work			
5.			
6.			
7.			
8.			
9.			

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date *(to the Office of Management and Budget, Division of Facilities Management)*.

All the terms and conditions of *(Project or Contract Number)* have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT OF EMPLOYEE DRUG TESTING PROGRAM

OMB Regulation 4104 for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

For more information, please refer to the following link for the full regulation: http://regulations.delaware.gov/register/september2015/final/19%20DE%20Reg%20207%2009-01-15.pdf

All the terms and conditions of *OMB Regulation 4104* have been thoroughly examined and are understood. We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

AN AFFIDAVIT SHALL BE PROVIDED BY THE BIDDER AND ALL SUBCONTRACTORS IDENTIFIED IN ATTACHED SUBCONTRACTOR LIST. STATEMENT(S) MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR A101-2007

The contract to be utilized on this project shall be the “Standard Form of Agreement Between Owner and Contractor” AIA Document A101-2007.

END OF SECTION 00 52 13

SUPPLEMENT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR A101-2007

The following supplements modify the "Standard Form of Agreement Between Owner and Contractor," AIA Document A101-2007. Where a portion of the Standard Form of Agreement is modified or deleted by the following, the unaltered portions of the Standard Form of Agreement shall remain in effect.

ARTICLE 5: PAYMENTS

5.1 PROGRESS PAYMENTS

5.1.3 Delete paragraph 5.1.3 in its entirety and replace with the following:

"Provided that a valid Application for Payment is received by the Architect that meets all requirements of the Contract, payment shall be made by the Owner not later than 30 days after the Owner receives the valid Application for Payment."

ARTICLE 8: MISCELLANEOUS PROVISIONS

8.2 Insert the following:

"Payments are due 30 days after receipt of a valid Application for Payment. After that 30 day period, interest may be charged at the rate of 1% per month not to exceed 12% per annum."

8.5 Delete paragraph 8.5 in its entirety and replace with the following:

"The Contractor's representative shall not be changed without ten days written notice to the Owner."

END OF SECTION 00 54 13

STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

PERFORMANCE BOND

Bond Number: _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("**Principal**"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("**Surety**"), are held and firmly bound unto the _____ ("**Owner**") (***insert State agency name***), in the amount of _____ ($_____), to be paid to **Owner**, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns, jointly and severally, for and in the whole, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20__.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if **Principal**, who has been awarded by **Owner** that certain contract known as Contract No. _____ dated the _____ day of _____, 20__ (the "Contract"), which Contract is incorporated herein by reference, shall well and truly provide and furnish all materials, appliances and tools and perform all the work required under and pursuant to the terms and conditions of the Contract and the Contract Documents (as defined in the Contract) or any changes or modifications thereto made as therein provided, shall make good and reimburse **Owner** sufficient funds to pay the costs of completing the Contract that **Owner** may sustain by reason of any failure or default on the part of **Principal**, and shall also indemnify and save harmless **Owner** from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, hereby stipulates and agrees, if requested to do so by **Owner**, to fully perform and complete the work to be performed under the Contract pursuant to the terms, conditions and covenants thereof, if for any cause **Principal** fails or neglects to so fully perform and complete such work.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of **Surety** and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and **Surety** hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to **Surety** as though done or omitted to be done by or in relation to **Principal**.

Surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of **Surety** and its bond.

Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to **Surety** or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, **Principal** and **Surety** have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

_____ By: _____(SEAL)
Name: Name:
Title:

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

_____ By: _____ (SEAL)
Name: Name:
Title:

(Corporate Seal)

STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

PAYMENT BOND

Bond Number: _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("**Principal**"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("**Surety**"), are held and firmly bound unto the _____ ("**Owner**") (***insert State agency name***), in the amount of _____ ($_____), to be paid to **Owner**, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns, jointly and severally, for and in the whole firmly by these presents.

Sealed with our seals and dated this _____ day of_____, 20__.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if **Principal**, who has been awarded by **Owner** that certain contract known as Contract No. _____dated the _____ day of _____, 20__ (the "Contract"), which Contract is incorporated herein by reference, shall well and truly pay all and every person furnishing materials or performing labor or service in and about the performance of the work under the Contract, all and every sums of money due him, her, them or any of them, for all such materials, labor and service for which **Principal** is liable, shall make good and reimburse **Owner** sufficient funds to pay such costs in the completion of the Contract as **Owner** may sustain by reason of any failure or default on the part of **Principal**, and shall also indemnify and save harmless **Owner** from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of **Surety** and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and **Surety** hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to **Surety** as though done or omitted to be done by or in relation to **Principal**.

Surety hereby stipulates and agrees that no modifications, omission or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of **Surety** and its bond.

Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to **Surety** or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, **Principal** and **Surety** have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

_____ By: _____(SEAL)
Name: Name:
Title:

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

_____ By: _____(SEAL)
Name: Name:
Title:

(Corporate Seal)

APPLICATION AND CERTIFICATION FOR PAYMENT

AIA DOCUMENT G702 PAGE ONE OF PAGES

TO OWNER:
Owner
0000 4th Street
Las Vegas, Nv. 00000

PROJECT: New Office & Warehouse

APPLICATION NO: 4

PERIOD TO: 12/31/99

Distribution to:
- [ ] OWNER
- [ ] ARCHITECT
- [ ] CONTRACTOR
- [ ] GENERAL CONTRACTOR
- [ ]

FROM CONTRACTOR:
XYZ ELECTRIC
000 Las Vegas BLVD.
Las Vegas, Nv. 00000

VIA ARCHITECT:
Arhitects
000 Tropicana Blvd.
Las Vegas, Nv. 00000

PROJECT NOS: NV000

CONTRACT FOR: Elect. Systems

VIA GENERAL CONTRACTOR: Burke And Associates

CONTRACT DATE: 08/13/99

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM		$ 120,693.00
2. Net change by Change Orders		$ 832.16
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$ 121,525.16
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$ 53,064.30
5. RETAINAGE:		
a. ___ % of Completed Work (Column D + E on G703)	$ 5,069.73	
b. ___ % of Stored Material (Column F on G703)	$ 236.70	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$ 5,306.43
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$ 47,757.87
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$ 21,970.80
8. CURRENT PAYMENT DUE		$ 25,787.07
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$	73,767.29

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	
Total approved this Month	$832.16	
TOTALS	$832.16	$0.00
NET CHANGES by Change Order	$832.16	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR: XYZ ELECTRIC

By: _____ Date: 12/31/99
President

State of:
Subscribed and sworn to before me this
Notary Public:
My Commission expires:

County of:
day of

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ _____

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and onthe Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CONTINUATION SHEET

AIA DOCUMENT G703

PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 4
APPLICATION DATE: 12/31/99
PERIOD TO: 12/31/99
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
1	Bid Depository Fee	$1,500.00	$1,500.00			$1,500.00	100.00%		$150.00
2	Equipment/Switch Gear (Materials Only)	$14,471.00	$9,607.00			$9,607.00	66.39%	$4,864.00	$960.70
3	Light Fixtures (Materials Only)	$22,087.00			$2,367.00	$2,367.00	10.72%	$19,720.00	$236.70
4	Fire Alarm - Rough	$7,748.00	$2,750.00	$312.00		$3,062.00	39.52%	$4,686.00	$306.20
5	Fire Alarm - Trim	$2,082.00						$2,082.00	$0.00
6	Office - Under Slab	$21,110.00	$10,555.00	$10,555.00		$21,110.00	100.00%		$2,111.00
7	Office - Rough	$15,395.00		$5,850.10		$5,850.10	38.00%	$9,544.90	$585.01
8	Office - Trim	$12,169.00						$12,169.00	$0.00
9	Warehouse - Under Slab	$7,634.00		$7,634.00		$7,634.00	100.00%		$763.40
10	Warehouse - Rough	$5,090.00		$1,934.20		$1,934.20	38.00%	$3,155.80	$193.42
11	Warehouse - Trim	$2,667.00						$2,667.00	$0.00
12	Site Underground	$8,740.00						$8,740.00	$0.00
13	Subcontract Change Order # 1 - Add Lighting	$832.16						$832.16	$0.00
									$0.00
									$0.00
									$0.00
									$0.00
									$0.00
									$0.00
									$0.00
									$0.00
									$0.00
									$0.00
									$0.00
	GRAND TOTALS	$121,525.16	$24,412.00	$26,285.30	$2,367.00	$53,064.30	43.67%	$68,460.86	$5,306.43

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GENERAL CONDITIONS

TO THE

CONTRACT

The General Conditions of this Contract are as stated in the American Institute of Architects Document AIA A201 (2007 Edition) entitled General Conditions of the Contract for Construction and is part of this project manual as if herein written in full.

END OF SECTION 00 72 13

SUPPLEMENTARY GENERAL CONDITIONS A201-2007

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201-2007. Where a portion of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

TABLE OF ARTICLES

ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the last sentence in its entirety and replace with the following:

"The Contract Documents also include Advertisement for Bid, Instructions to Bidder, sample forms, the Bid Form, the Contractor's completed Bid and the Award Letter."

Add the following Paragraph:

1.1.1.1 In the event of conflict or discrepancies among the Contract Documents, the Documents prepared by the State of Delaware, Division of Facilities Management shall take precedence over all other documents.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Paragraphs:

1.2.4 In the case of an inconsistency between the Drawings and the Specifications, or within either document not clarified by addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect's interpretation.

1.2.5 The word "PROVIDE" as used in the Contract Documents shall mean "FURNISH AND INSTALL" and shall include, without limitation, all labor, materials, equipment, transportation, services and other items required to complete the Work.

1.2.6 The word "PRODUCT" as used in the Contract Documents means all materials, systems and equipment.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

Delete Paragraph 1.5.1 in its entirety and replace with the following:

"All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. Such documents may be used by the Owner to construct one or more like Projects without the approval of, or additional compensation to, the Architect. The Contractor, Subcontractors, Sub-subcontractors and Material or Equipment Suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in the execution of their Work under the Contract Documents. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or Material and Equipment Supplier on other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect's consultants.

The Architect shall not be liable for injury or damage resulting from the re-use of drawings and specifications if the Architect is not involved in the re-use Project. Prior to re-use of construction documents for a Project in which the Architect is not also involved, the Owner will remove from such documents all identification of the original Architect, including name, address and professional seal or stamp."

Delete Paragraph 1.5.2 in its entirety.

ARTICLE 2: OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

To Subparagraph 2.2.3 – Add the following sentence:

"The Contractor, at their expense shall bear the costs to accurately identify the location of all underground utilities in the area of their excavation and shall bear all cost for any repairs required, out of failure to accurately identify said utilities."

Delete Subparagraph 2.2.5 in its entirety and substitute the following:

2.2.5 The Contractor shall be furnished free of charge up to five (5) sets of the Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Amend Paragraph 3.2.2 to state that any errors, inconsistencies or omissions discovered shall be reported to the Architect and Owner immediately.

Delete the third sentence in Paragraph 3.2.3.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Paragraphs:

3.3.2.1 The Contractor shall immediately remove from the Work, whenever requested to do so by the Owner, any person who is considered by the Owner or Architect to be incompetent or disposed to be so disorderly, or who for any reason is not satisfactory to the Owner, and that person shall not again be employed on the Work without the consent of the Owner or the Architect.

3.3.4 The Contractor must provide suitable storage facilities at the Site for the proper protection and safe storage of their materials. Consult the Owner and the Architect before storing any materials.

3.3.5 When any room is used as a shop, storeroom, office, etc., by the Contractor or Subcontractor(s) during the construction of the Work, the Contractor making use of these areas will be held responsible for any repairs, patching or cleaning arising from such use.

3.4 LABOR AND MATERIALS

Add the Following Paragraphs:

3.4.4 Before starting the Work, each Contractor shall carefully examine all preparatory Work that has been executed to receive their Work. Check carefully, by whatever means are required, to insure that its Work and adjacent, related Work, will finish to proper contours, planes and levels. Promptly notify the General Contractor/Construction Manager of any defects or imperfections in preparatory Work which will in any way affect satisfactory completion of its Work. Absence of such notification will be construed as an acceptance of preparatory Work and later claims of defects will not be recognized.

3.4.5 Under no circumstances shall the Contractor's Work proceed prior to preparatory Work proceed prior to preparatory Work having been completely cured, dried and/or otherwise made satisfactory to receive this Work. Responsibility for timely installation of all materials rests solely with the Contractor responsible for that Work, who shall maintain coordination at all times.

3.5 WARRANTY

Add the following Paragraphs:

3.5.1 The Contractor will guarantee all materials and workmanship against original defects, except injury from proper and usual wear when used for the purpose intended, for two years after Acceptance by the Owner, and will maintain all items in perfect condition during the period of guarantee.

3.5.2 Defects appearing during the period of guarantee will be made good by the Contractor at his expense upon demand of the Owner, it being required that all work will be in perfect condition when the period of guarantee will have elapsed.

3.5.3 In addition to the General Guarantee there are other guarantees required for certain items for different periods of time than the two years as above, and are particularly so stated in that part of the specifications referring to same. The said guarantees will commence at the same time as the General Guarantee.

3.5.4 If the Contractor fails to remedy any failure, defect or damage within a reasonable time after receipt of notice, the Owner will have the right to replace, repair, or otherwise remedy the failure, defect or damage at the Contractor's expense.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following Paragraphs:

3.11.1 During the course of the Work, the Contractor shall maintain a record set of drawings on which the Contractor shall mark the actual physical location of all piping, valves, equipment, conduit, outlets, access panels, controls, actuators, including all appurtenances that will be concealed once construction is complete, etc., including all invert elevations.

3.11.2 At the completion of the project, the Contractor shall obtain a set of reproducible drawings from the Architect, and neatly transfer all information outlined in 3.11.1 to provide a complete record of the as-built conditions.

3.11.3 The Contractor shall provide two (2) prints of the as-built conditions, along with the reproducible drawings themselves, to the Owner and one (1) set to the Architect. In addition, attach one complete set to each of the Operating and Maintenance Instructions/Manuals.

3.17 In the second sentence of the paragraph, insert "indemnify" between "shall" and "hold".

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.2 ADMINISTRATION OF THE CONTRACT

Delete the first sentence of Paragraph 4.2.7 and replace with the following:

The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples for the purpose of checking for conformance with the Contract Documents.

Delete the second sentence of Paragraph 4.2.7 and replace with the following:

The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work in the activities of the Owner, Contractor or separate Contractors, while allowing sufficient time in the Owner's professional judgment to permit adequate review.

Add the following Paragraph:

4.2.10.1 There will be no full-time project representative provided by the Owner or Architect on this project.

Add to Paragraph 4.2.13 "and in compliance with all local requirements." to the end of the sentence

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Paragraph 5.2.3 in its entirety and replace with the following:

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection, subject to the statutory requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

Delete Paragraph 6.1.4 in its entirety.

6.2 MUTUAL RESPONSIBILITY

6.2.3 In the second sentence, strike the word "shall" and insert the word "may".

ARTICLE 7: CHANGES IN THE WORK

(SEE ARTICLE 7: CHANGES IN WORK IN THE GENERAL REQUIREMENTS)

ARTICLE 8: TIME

8.2 PROGRESS AND COMPLETION

Add the following Paragraphs:

8.2.1.1 Refer to Specification Section SUMMARY OF WORK for Contract time requirements.

8.2.4 If the Work falls behind the Progress Schedule as submitted by the Contractor, the Contractor shall employ additional labor and/or equipment necessary to bring the Work into compliance with the Progress Schedule at no additional cost to the Owner.

8.3 DELAYS AND EXTENSION OF TIME

8.3.1 Strike “arbitration” and insert “remedies at law or in equity”.

Add the following Paragraph:

8.3.2.1 The Contractor shall update the status of the suspension, delay, or interruption of the Work with each Application for Payment. (The Contractor shall report the termination of such cause immediately upon the termination thereof.) Failure to comply with this procedure shall constitute a waiver for any claim for adjustment of time or price based upon said cause.

Delete Paragraph 8.3.3 in its entirety and replace with the following:

8.3.3 Except in the case of a suspension of the Work directed by the Owner, an extension of time under the provisions of Paragraph 8.3.1 shall be the Contractor’s sole remedy in the progress of the Work and there shall be no payment or compensation to the Contractor for any expense or damage resulting from the delay.

Add the following Paragraph:

8.3.4 By permitting the Contractor to work after the expired time for completion of the project, the Owner does not waive their rights under the Contract.

ARTICLE 9: PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following Paragraphs:

9.2.1 The Schedule of Values shall be submitted using AIA Document G702, Continuation Sheet to G703.

9.2.2 The Schedule of Values is to include a line item for Project Closeout Document Submittal. The value of this item is to be no less than 1% of the initial contract amount.

9.3 APPLICATIONS FOR PAYMENT

Add the following Paragraph:

9.3.1.3 Application for Payment shall be submitted on AIA Document G702 “Application and Certificate for Payment”, supported by AIA Document G703 “Continuation Sheet”. Said Applications shall be fully executed and notarized.

Add the following Paragraphs:

9.3.4 Until Closeout Documents have been received and outstanding items completed the Owner will pay 95% (ninety-five percent) of the amount due the Contractor on account of progress payments.

9.3.5 The Contractor shall provide a current and updated Progress Schedule to the Architect with each Application for Payment. Failure to provide Schedule will be just cause for rejection of Application for Payment.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following to 9.5.1:

.8 failure to provide a current Progress Schedule;
.9 a lien or attachment is filed;
.10 failure to comply with mandatory requirements for maintaining Record Documents.

9.6 PROGRESS PAYMENTS

Delete Paragraph 9.6.1 in its entirety and replace with the following:

9.6.1 After the Architect has approved and issued a Certificate for Payment, payment shall be made by the Owner within 30 days after Owner's receipt of the Certificate for Payment.

9.7 FAILURE OF PAYMENT

In first sentence, strike "seven" and insert "thirty (30)". Also strike "binding dispute resolution" and insert "remedies at law or in equity".

9.8 SUBSTANTIAL COMPLETION

To Subparagraph 9.8.3 - Add the following sentence:

"If the Architect is required to make more than 2 inspections of the same portion of work, the Contractor shall be responsible for all costs associated with subsequent inspections including but not limited to any Architect's fees."

9.8.5 In the second sentence, strike "shall" and insert "may".

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following Paragraphs:

10.1.1.1.1 Each Contractor shall develop a safety program in accordance with the Occupational Safety and Health Act of 1970. A copy of said plan shall be furnished to the Owner and Architect prior to the commencement of that Contractor's Work.

10.1.2 Each Contractor shall appoint a Safety Representative. Safety Representatives shall be someone who is on site on a full time basis. If deemed necessary by the Owner or Architect, Contractor Safety meetings will be scheduled. The attendance of all Safety Representatives will be required. Minutes will be recorded of said meetings by the Contractor and will be distributed to all parties as well as posted in all job offices/trailers etc.

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following Paragraph:

10.2.4.1 As required in the Hazardous Chemical Act of June 1984, all vendors supplying any material that may be defined as hazardous must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a caution warning on the label relating to a potential physical or health hazard, if it is known to be present in the work place, and if employees may be exposed under normal conditions or in foreseeable emergency situations. Material Safety Data Sheets shall be provided directly to the Owner, along with the shipping slips that include those products.

10.3 HAZARDOUS MATERIALS

Delete Paragraph 10.3.3 in its entirety.

Delete Paragraph 10.3.6 in its entirety.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.4 Strike "the Owner" immediately following "(1)" and strike "and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations."

11.2 OWNER'S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Paragraph 11.3 in its entirety and replace with the following:

11.3 The State will not provide Builder's All Risk Insurance for the Project. The Contractor and all Subcontractors shall provide property coverage for their tools and equipment, as necessary. Any mandatory deductible required by the Contractor's Insurance shall be the responsibility of the Contractor.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 Add the following sentence: "The bonds will conform to those forms approved by the Office of Management and Budget."

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

Add the following Paragraph:

12.2.2.1.1 At any time during the progress of the Work, or in any case where the nature of the defects will be such that it is not expedient to have corrected, the Owner, at its option, will have the right to deduct such sum, or sums, of money from the amount of the Contract as it considers justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

12.2.2.1 Strike "one" and insert "two".

12.2.2.2 Strike "one" and insert "two".

12.2.2.3 Strike "one" and insert "two".

12.2.5 In second sentence, strike "one" and insert "two".

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Strike “except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.”

13.6 INTEREST

Strike “the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.” Insert “30 days of presentment of the authorized Certificate of Payment at the annual rate of 12% or 1% per month.

13.7 TIME LIMITS ON CLAIMS

Strike the last sentence.

Add the following Paragraph:

13.8 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS

13.8.1 If any provision, specifications or requirement of the Contract Documents conflict or is inconsistent with any statute, law or regulation of the government of the United State of America, the Contractor shall notify the Architect and Owner immediately upon discovery.

Add the following Paragraph:

13.9 CLOUD-BASED PROJECT MANAGEMENT SYSTEM

13.9.1 The Contractor is responsible for communicating to the Owner and the Architect using the University’s Cloud-Based Project Management System for the duration of the contract. The Owner will administer the site and shall provide login credentials to the Contractor following contract award.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete Paragraph 14.4.3 in its entirety and replace with the following:

14.4.3 In case of such termination for the Owner’s convenience, the Contractor shall be entitled to receive payment for Work executed, and cost incurred by reason of such termination along with reasonable overhead.

ARTICLE 15: CLAIMS AND DISPUTES

15.1.2 Throughout the Paragraph strike “21” and insert “45”.

15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete Paragraph 15.1.6 in its entirety.

15.2 INITIAL DECISION

Delete Paragraph 15.2.5 in its entirety and replace with the following:

15.2.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefore and shall notify the parties of any change in the Contract Sum or

Contract Time or both. The approval or rejection of a Claim by the Architect shall be subject to mediation and other remedies at law or in equity.

Delete Paragraph 15.2.6 and its subparagraphs in their entirety.

15.3 MEDIATION

15.3.1 Strike “binding dispute resolution” and insert “any or all remedies at law or in equity”.

15.3.2 In the first sentence, delete “administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedure in effect on the date of the Agreement,” Strike “binding dispute resolution” and insert “remedies at law and in equity”.

15.4 ARBITRATION

Delete Paragraph 15.4 and its sub-sections in its entirety.

END OF SECTION 00 73 13

GENERAL REQUIREMENTS

TABLE OF ARTICLES

ARTICLE 1: GENERAL

1.1 CONTRACT DOCUMENTS

1.1.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to an extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.1.2 Work including material purchases shall not begin until the Contractor is in receipt of a bonafide State of Delaware Purchase Order. Any work performed or material purchases prior to the issuance of the Purchase Order is done at the Contractor's own risk and cost.

1.2 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

1.2.1 For Public Works Projects financed in whole or in part by state appropriation the Contractor agrees that during the performance of this contract:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, sex, color, sexual orientation, gender identity or national origin. The Contractor will take positive steps to ensure that applicants are employed and that employees are treated during employment without regard to their race, creed, sex, color, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, sex, color, sexual orientation, gender identity or national origin."

ARTICLE 2: OWNER

(NO ADDITIONAL GENERAL REQUIREMENTS – SEE SUPPLEMENTARY GENERAL CONDITIONS)

ARTICLE 3: CONTRACTOR

3.1 Schedule of Values: The successful Bidder shall within twenty (20) days after receiving notice to proceed with the work, furnish to the Owner a complete schedule of values on the various items comprising the work.

3.2 Subcontracts: Upon approval of Subcontractors, the Contractor shall award their Subcontracts as soon as possible after the signing of their own contract and see that all material, their own and those of their Subcontractors, are promptly ordered so that the work will not be delayed by failure of materials to arrive on time.

3.3 Before commencing any work or construction, the General Contractor is to consult with the Owner as to matters in connection with access to the site and the allocation of Ground Areas for the various features of hauling, storage, etc.

3.4 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions.

3.5 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.6 The Contractor warrants to the Owner that materials and equipment furnished will be new and of good quality, unless otherwise permitted, and that the work will be free from defects and in conformance with the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved, may be considered defective. If required by the Owner, the Contractor shall furnish evidence as to the kind and quality of materials and equipment provided.

3.7 Unless otherwise provided, the Contractor shall pay all sales, consumer, use and other similar taxes, and shall secure and pay for required permits, fees, licenses, and inspections necessary for proper execution of the Work.

3.8 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work. The Contractor shall promptly notify the Owner if the Drawings and Specifications are observed to be at variance therewith.

3.9 The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under contract with the Contractor.

3.10 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project all waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. The Contractor shall be responsible for returning all damaged areas to their original conditions.

3.11 STATE LICENSE AND TAX REQUIREMENTS

3.11.1 Each Contractor and Subcontractor shall be licensed to do business in the State of Delaware and shall pay all fees and taxes due under State laws. In conformance with Section 2503, Chapter 25, Title 30, Delaware Code, "the Contractor shall furnish the Delaware Department of Finance within ten (10) days after entering into any contract with a contractor or subcontractor not a resident of this State, a statement of total value of such contract or contracts together with the names and addresses of the contracting parties."

3.12. The Contractor shall comply with all requirements set forth in Section 6962, Chapter 69, Title 29 of the Delaware Code.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.1 CONTRACT SURETY

4.1.1 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

4.1.2 All bonds will be required as follows unless specifically waived elsewhere in the Bidding Documents.

4.1.3 Contents of Performance Bonds – The bond shall be in the form approved by the Office of Management and Budget. The bond shall be conditioned upon the faithful compliance and performance by the successful bidder of each and every term and condition of the contract and the

proposal, plans, specifications, and bid documents thereof. Each term and condition shall be met at the time and in the manner prescribed by the Contract, Bid documents and the specifications, including the payment in full to every person furnishing materiel or performing labor in the performance of the Contract, of all sums of money due the person for such labor and materiel. (The bond shall also contain the successful bidder's guarantee to indemnify and save harmless the State and the agency from all costs, damages and expenses growing out of or by reason of the Contract in accordance with the Contract.)

4.1.4 Invoking a Performance Bond – The agency may, when it considers that the interest of the State so require, cause judgement to be confessed upon the bond.

4.1.5 Within twenty (20) days after the date of notice of award of contract, the Bidder to whom the award is made shall furnish a Performance Bond and Labor and Material Payment Bond, each equal to the full amount of the Contract price to guarantee the faithful performance of all terms, covenants and conditions of the same. The bonds are to be issued by an acceptable Bonding Company licensed to do business in the State of Delaware and shall be issued in duplicate.

4.1.6 Performance and Payment Bonds shall be maintained in full force (warranty bond) for a period of two (2) years after the date of the Certificate for Final Payment. The Performance Bond shall guarantee the satisfactory completion of the Project and that the Contractor will make good any faults or defects in his work which may develop during the period of said guarantees as a result of improper or defective workmanship, material or apparatus, whether furnished by themselves or their Sub-Contractors. The Payment Bond shall guarantee that the Contractor shall pay in full all persons, firms or corporations who furnish labor or material or both labor and material for, or on account of, the work included herein. The bonds shall be paid for by this Contractor. The Owner shall have the right to demand that the proof parties signing the bonds are duly authorized to do so.

4.2 FAILURE TO COMPLY WITH CONTRACT

4.2.1 If any firm entering into a contract with the State, or Agency that neglects or refuses to perform or fails to comply with the terms thereof, the Agency which signed the Contract may terminate the Contract and proceed to award a new contract in accordance with this Chapter 69, Title 29 of the Delaware Code or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond. Nothing herein shall preclude the Agency from pursing additional remedies as otherwise provided by law.

4.3 CONTRACT INSURANCE AND CONTRACT LIABILITY

4.3.1 In addition to the bond requirements stated in the Bid Documents, each successful Bidder shall purchase adequate insurance for the performance of the Contract and, by submission of a Bid, agrees to indemnify and save harmless and to defend all legal or equitable actions brought against the State, any Agency, officer and/or employee of the State, for and from all claims of liability which is or may be the result of the successful Bidder's actions during the performance of the Contract.

4.3.2 The purchase or nonpurchase of such insurance or the involvement of the successful Bidder in any legal or equitable defense of any action brought against the successful Bidder based upon work performed pursuant to the Contract will not waive any defense which the State, its agencies and their respective officers, employees and agents might otherwise have against such claims, specifically including the defense of sovereign immunity, where applicable, and by the terms of this section, the State and all agencies, officers and employees thereof shall not be financially responsible for the consequences of work performed, pursuant to said contract.

4.4 RIGHT TO AUDIT RECORDS

4.4.1 The Owner shall have the right to audit the books and records of a Contractor or any Subcontractor under any Contract or Subcontract to the extent that the books and records relate to the performance of the Contract or Subcontract.

4.4.2 Said books and records shall be maintained by the Contractor for a period of seven (7) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of seven (7) years from the date of final payment under the Subcontract.

ARTICLE 5: SUBCONTRACTORS

5.1 SUBCONTRACTING REQUIREMENTS

5.1.1 All contracts for the construction, reconstruction, alteration or repair of any public building (not a road, street or highway) shall be subject to the following provisions:

1. A contract shall be awarded only to a Bidder whose Bid is accompanied by a statement containing, for each Subcontractor category, the name and address (city or town and State only – street number and P.O. Box addresses not required) of the subcontractor whose services the Bidder intends to use in performing the Work and providing the material for such Subcontractor category.

2. A Bid will not be accepted nor will an award of any Contract be made to any Bidder which, as the Prime Contractor, has listed itself as the Subcontractor for any Subcontractor unless:

   A. It has been established to the satisfaction of the awarding Agency that the Bidder has customarily performed the specialty work of such Subcontractor category by artisans regularly employed by the Bidder's firm;

   B. That the Bidder is duly licensed by the State to engage in such specialty work, if the State requires licenses; and

   C. That the Bidder is recognized in the industry as a bona fide Subcontractor or Contractor in such specialty work and Subcontractor category.

5.1.2 The decision of the awarding Agency as to whether a Bidder who list itself as the Subcontractor for a Subcontractor category shall be final and binding upon all Bidders, and no action of any nature shall lie against any awarding agency or its employees or officers because of its decision in this regard.

5.1.3 After such a Contract has been awarded, the successful Bidder shall not substitute another Subcontractor for any Subcontractor whose name was set forth in the statement which accompanied the Bid without the written consent of the awarding Agency.

5.1.4 No Agency shall consent to any substitution of Subcontractors unless the Agency is satisfied that the Subcontractor whose name is on the Bidders accompanying statement:

A. Is unqualified to perform the work required;

B. Has failed to execute a timely reasonable Subcontract;

C. Has defaulted in the performance on the portion of the work covered by the Subcontract; or

D. Is no longer engaged in such business.

5.1.5 Should a Bidder be awarded a contract, such successful Bidder shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

5.2 PENALTY FOR SUBSTITUTION OF SUBCONTRACTORS

5.2.1 Should the Contractor fail to utilize any or all of the Subcontractors in the Contractor's Bid statement in the performance of the Work on the public bidding, the Contractor shall be penalized in the amount of (project specific amount*). The Agency may determine to deduct payments of the penalty from the Contractor or have the amount paid directly to the Agency. Any penalty amount assessed against the Contractor may be remitted or refunded, in whole or in part, by the Agency awarding the Contract, only if it is established to the satisfaction of the Agency that the Subcontractor in question has defaulted or is no longer engaged in such business. No claim for the remission or refund of any penalty shall be granted unless an application is filed within one year after the liability of the successful Bidder accrues. All penalty amounts assessed and not refunded or remitted to the contractor shall be reverted to the State.

*one (1) percent of contract amount not to exceed $10,000

5.3 ASBESTOS ABATEMENT

5.3.1 The selection of any Contractor to perform asbestos abatement for State-funded projects shall be approved by the Office of Management and Budget, Division of Facilities Management pursuant to Chapter 78 of Title 16.

5.4 STANDARDS OF CONSTRUCTION FOR THE PROTECTION OF THE PHYSICALLY HANDICAPPED

5.4.1 All Contracts shall conform with the standard established by the Delaware Architectural Accessibility Board unless otherwise exempted by the Board.

5.5 CONTRACT PERFORMANCE

5.5.1 Any firm entering into a Public Works Contract that neglects or refuses to perform or fails to comply with its terms, the Agency may terminate the Contract and proceed to award a new Contract or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond.

ARTICLE 6: CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

6.1 The Owner reserves the right to simultaneously perform other construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other Projects at the same site.

6.2 The Contractor shall afford the Owner and other Contractors reasonable opportunity for access and storage of materials and equipment, and for the performance of their activities, and shall connect and coordinate their activities with other forces as required by the Contract Documents.

ARTICLE 7: CHANGES IN THE WORK

7.1 The Owner, without invalidating the Contract, may order changes in the Work consisting of Additions, Deletions, Modifications or Substitutions, with the Contract Sum and Contract completion date being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Professional, as the duly authorized agent, the Contractor and the Owner.

7.2 The Contract Sum and Contract Completion Date shall be adjusted only by a fully executed Change Order.

7.3 The additional cost, or credit to the Owner resulting from a change in the Work shall be by mutual agreement of the Owner, Contractor and the Architect. In all cases, this cost or credit shall be based on the 'DPE' wages required and the "invoice price" of the materials/equipment needed.

7.3.1 "DPE" shall be defined to mean "direct personnel expense". Direct payroll expense includes direct salary plus customary fringe benefits (prevailing wage rates) and documented statutory costs such as workman's compensation insurance, Social Security/Medicare, and unemployment insurance (a maximum multiplier of 1.35 times DPE).

7.3.2 "Invoice price" of materials/equipment shall be defined to mean the actual cost of materials and/or equipment that is paid by the Contractor, (or subcontractor), to a material distributor, direct factory vendor, store, material provider, or equipment leasing entity. Rates for equipment that is leased and/or owned by the Contractor or subcontractor(s) shall not exceed those listed in the latest version of the "Means Building Construction Cost Data" publication.

7.3.3 In addition to the above, the General Contractor is allowed a fifteen percent (15%) markup for overhead and profit for additional work performed by the General Contractor's own forces. For additional subcontractor work, the Subcontractor is allowed a fifteen (15) percent overhead and profit on change order work above and beyond the direct costs stated previously. To this amount, the General Contractor will be allowed a mark-up not exceeding seven and one half percent (7.5%) on the subcontractors work. These mark-ups shall include all costs including, but not limited to: overhead, profit, bonds, insurance, supervision, etc. No markup is permitted on the work of the subcontractors subcontractor. No additional costs shall be allowed for changes related to the Contractor's onsite superintendent/staff, or project manager, unless a change in the work changes the project duration and is identified by the CPM schedule. There will be no other costs associated with the change order.

ARTICLE 8: TIME

8.1 Time limits, if any, are as stated in the Project Manual. By executing the Agreement, the Contractor confirms that the stipulated limits are reasonable, and that the Work will be completed within the anticipated time frame.

8.2 If progress of the Work is delayed at any time by changes ordered by the Owner, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions, unavoidable casualties or other causes beyond the Contractor's control, the Contract Time shall be extended for such reasonable time as the Owner may determine.

8.3 Any extension of time beyond the date fixed for completion of the construction and acceptance of any part of the Work called for by the Contract, or the occupancy of the building by the Owner, in whole or in part, previous to the completion shall not be deemed a waiver by the Owner of his right to annul or terminate the Contract for abandonment or delay in the matter provided for, nor relieve the Contractor of full responsibility.

8.4 SUSPENSION AND DEBARMENT

8.4.1 Per Section 6962(d)(14), Title 29, Delaware Code, "Any Contractor who fails to perform a public works contract or complete a public works project within the time schedule established by the Agency in the

Invitation To Bid, may be subject to Suspension or Debarment for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the Project."

8.4.2 "Upon such failure for any of the above stated reasons, the Agency that contracted for the public works project may petition the Director of the Office of Management and Budget for Suspension or Debarment of the Contractor. The Agency shall send a copy of the petition to the Contractor within three (3) working days of filing with the Director. If the Director concludes that the petition has merit, the Director shall schedule and hold a hearing to determine whether to suspend the Contractor, debar the Contractor or deny the petition. The Agency shall have the burden of proving, by a preponderance of the evidence, that the Contractor failed to perform or complete the public works project within the time schedule established by the Agency and failed to do so for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the project. Upon a finding in favor of the Agency, the Director may suspend a Contractor from Bidding on any project funded, in whole or in part, with public funds for up to 1 year for a first offense, up to 3 years for a second offense and permanently debar the Contractor for a third offense. The Director shall issue a written decision and shall send a copy to the Contractor and the Agency. Such decision may be appealed to the Superior Court within thirty (30) days for a review on the record."

8.5 RETAINAGE

8.5.1 Per Section 6962(d)(5) a.3, Title 29, Delaware Code: The Agency may at the beginning of each public works project establish a time schedule for the completion of the project. If the project is delayed beyond the completion date due to the Contractor's failure to meet their responsibilities, the Agency may forfeit, at its discretion, all or part of the Contractor's retainage.

8.5.2 This forfeiture of retainage also applies to the timely completion of the punchlist. A punchlist will only be prepared upon the mutual agreement of the Owner, Architect and Contractor. Once the punchlist is prepared, all three parties will by mutual agreement, establish a schedule for its completion. Should completion of the punchlist be delayed beyond the established date due to the Contractor's failure to meet their responsibilities, the Agency may hold permanently, at its discretion, all or part of the Contractor's retainage.

ARTICLE 9: PAYMENTS AND COMPLETION

9.1 APPLICATION FOR PAYMENT

9.1.1 Applications for payment shall be made upon AIA Document G702. There will be a five percent (5%) retainage on all Contractor's monthly invoices until completion of the project. This retainage may become payable upon receipt of all required closeout documentation, provided all other requirements of the Contract Documents have been met.

9.1.2 A date will be fixed for the taking of the monthly account of work done. Upon receipt of Contractor's itemized application for payment, such application will be audited, modified, if found necessary, and approved for the amount. Statement shall be submitted to the Owner.

9.1.3 Section 6516, Title 29 of the Delaware Code annualized interest is not to exceed 12% per annum beginning thirty (30) days after the "presentment" (as opposed to the date) of the invoice.

9.2 PARTIAL PAYMENTS

9.2.1 Any public works Contract executed by any Agency may provide for partial payments at the option of the Owner with respect to materials placed along or upon the sites or stored at secured locations, which are suitable for use in the performance of the contract.

9.2.2 When approved by the agency, partial payment may include the values of tested and acceptable materials of a nonperishable or noncontaminative nature which have been produced or furnished for incorporation as a permanent part of the work yet to be completed, provided acceptable provisions have been made for storage.

9.2.2.1 Any allowance made for materials on hand will not exceed the delivered cost of the materials as verified by invoices furnished by the Contractor, nor will it exceed the contract bid price for the material complete in place.

9.2.3 If requested by the Agency, receipted bills from all Contractors, Subcontractors, and material, men, etc., for the previous payment must accompany each application for payment. Following such a request, no payment will be made until these receipted bills have been received by the Owner.

9.3 SUBSTANTIAL COMPLETION

9.3.1 When the building has been made suitable for occupancy, but still requires small items of miscellaneous work, the Owner will determine the date when the project has been substantially completed.

9.3.2 If, after the Work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor, and without terminating the Contract, the Owner may make payment of the balance due for the portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment that it shall not constitute a waiver of claims.

9.3.3 On projects where commissioning is included, the commissioning work as defined in the specifications must be complete prior to the issuance of substantial completion.

9.4 FINAL PAYMENT

9.4.1 Final payment, including the five percent (5%) retainage if determined appropriate, shall be made within thirty (30) days after the Work is fully completed and the Contract fully performed and provided that the Contractor has submitted the following closeout documentation (in addition to any other documentation required elsewhere in the Contract Documents):

9.4.1.1 Evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the work have been paid,

9.4.1.2 An acceptable RELEASE OF LIENS,

9.4.1.3 Copies of all applicable warranties,

9.4.1.4 As-built drawings,

9.4.1.5 Operations and Maintenance Manuals,

9.4.1.6 Instruction Manuals,

9.4.1.7 Consent of Surety to final payment.

9.4.1.8 The Owner reserves the right to retain payments, or parts thereof, for its protection until the foregoing conditions have been complied with, defective work corrected and all unsatisfactory conditions remedied.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take all reasonable precautions to prevent damage, injury or loss to: workers, persons nearby who may be affected, the Work, materials and equipment to be incorporated, and existing property at the site or adjacent thereto. The Contractor shall give notices and comply with applicable laws ordinances, rules regulations, and lawful orders of public authorities bearing on the safety of persons and property and their protection from injury, damage, or loss. The Contractor shall promptly remedy damage and loss to property at the site caused in whole or in part by the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable.

10.2 The Contractor shall notify the Owner in the event any existing hazardous material such as lead, PCBs, asbestos, etc. is encountered on the project. The Owner will arrange with a qualified specialist for the identification, testing, removal, handling and protection against exposure or environmental pollution, to comply with applicable regulation laws and ordinances. The Contractor and Architect will not be required to participate in or to perform this operation. Upon completion of this work, the Owner will notify the Contractor and Architect in writing the area has been cleared and approved by the authorities in order for the work to proceed. The Contractor shall attach documentation from the authorities of said approval.

10.3 As required in the Hazardous Chemical Information Act of June 1984, all vendors supplying any materials that may be defined as hazardous, must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a warning caution on the label relating to a potential physical or health hazard, if it is known to be present in the work place, and if employees may be exposed under normal conditions or in any foreseeable emergency situation. Material Safety Data Sheets must be provided directly to the Owner along with the shipping slips that include those products.

10.4 The Contractor shall certify to the Owner that materials incorporated into the Work are free of all asbestos. This certification may be in the form of Material Safety Data Sheet (MSDS) provided by the product manufacturer for the materials used in construction, as specified or as provided by the Contractor.

ARTICLE 11: INSURANCE AND BONDS

11.1 The Contractor shall carry all insurance required by law, such as Unemployment Insurance, etc. The Contractor shall carry such insurance coverage as they desire on their own property such as a field office, storage sheds or other structures erected upon the project site that belong to them and for their own use. The Subcontractors involved with this project shall carry whatever insurance protection they consider necessary to cover the loss of any of their personal property, etc.

11.2 Upon being awarded the Contract, the Contractor shall obtain a minimum of two (2) copies of all required insurance certificates called for herein, and submit one (1) copy of each certificate, to the Owner, within 20 days of contract award.

11.3 Bodily Injury Liability and Property Damage Liability Insurance shall, in addition to the coverage included herein, include coverage for injury to or destruction of any property arising out of the collapse of or structural injury to any building or structure due to demolition work and evidence of these coverages shall be filed with and approved by the Owner.

11.4 The Contractor's Property Damage Liability Insurance shall, in addition to the coverage noted herein, include coverage on all real and personal property in their care, custody and control damaged in any way by the Contractor or their Subcontractors during the entire construction period on this project.

11.5 Builders Risk (including Standard Extended Coverage Insurance) on the existing building during the entire construction period, shall not be provided by the Contractor under this contract. The Owner shall insure the existing building and all of its contents and all this new alteration work under this

contract during entire construction period for the full insurable value of the entire work at the site. Note, however, that the Contractor and their Subcontractors shall be responsible for insuring building materials (installed and stored) and their tools and equipment whenever in use on the project, against fire damage, theft, vandalism, etc.

11.6 Certificates of the insurance company or companies stating the amount and type of coverage, terms of policies, etc., shall be furnished to the Owner, within 20 days of contract award.

11.7 The Contractor shall, at their own expense, (in addition to the above) carry the following forms of insurance:

11.7.1 Contractor's Contractual Liability Insurance

Minimum coverage to be:

Bodily Injury	$500,000	for each person
	$1,000,000	for each occurrence
	$1,000,000	aggregate
Property Damage	$500,000	for each occurrence
	$1,000,000	aggregate

11.7.2 Contractor's Protective Liability Insurance

Minimum coverage to be:

Bodily Injury	$500,000	for each person
	$1,000,000	for each occurrence
	$1,000,000	aggregate
Property Damage	$500,000	for each occurrence
	$500,000	aggregate

11.7.3 Automobile Liability Insurance

Minimum coverage to be:

Bodily Injury	$1,000,000	for each person
	$1,000,000	for each occurrence
Property Damage	$500,000	per accident

11.7.4 Prime Contractor's and Subcontractors' policies shall include contingent and contractual liability coverage in the same minimum amounts as 11.7.1 above.

11.7.5 Workmen's Compensation (including Employer's Liability):

11.7.5.1 Minimum Limit on employer's liability to be as required by law.

11.7.5.2 Minimum Limit for all employees working at one site.

11.7.6 Certificates of Insurance must be filed with the Owner guaranteeing fifteen (15) days prior notice of cancellation, non-renewal, or any change in coverages and limits of liability shown as included on certificates.

11.7.7 Social Security Liability

11.7.7.1 With respect to all persons at any time employed by or on the payroll of the Contractor or performing any work for or on their behalf, or in connection with or arising out of the Contractor's business, the Contractor shall accept full and exclusive liability for the payment of any and all contributions or taxes or unemployment insurance, or old age retirement benefits, pensions or annuities now or hereafter imposed by the Government of the United States and the State or political subdivision thereof, whether the same be measured by wages, salaries or other remuneration paid to such persons or otherwise.

11.7.7.2 Upon request, the Contractor shall furnish Owner such information on payrolls or employment records as may be necessary to enable it to fully comply with the law imposing the aforesaid contributions or taxes.

11.7.7.3 If the Owner is required by law to and does pay any and/or all of the aforesaid contributions or taxes, the Contractor shall forthwith reimburse the Owner for the entire amount so paid by the Owner.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.1 The Contractor shall promptly correct Work rejected by the Owner or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed, and shall correct any Work found to be not in accordance with the requirements of the Contract Documents within a period of two years from the date of Substantial Completion, or by terms of an applicable special warranty required by the Contract Documents. The provisions of this Article apply to work done by Subcontractors as well as to Work done by direct employees of the Contractor.

12.2 At any time during the progress of the work, or in any case where the nature of the defects shall be such that it is not expedient to have them corrected, the Owner, at their option, shall have the right to deduct such sum, or sums, of money from the amount of the contract as they consider justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 CUTTING AND PATCHING

13.1.1 The Contractor shall be responsible for all cutting and patching. The Contractor shall coordinate the work of the various trades involved.

13.2 DIMENSIONS

13.2.1 All dimensions shown shall be verified by the Contractor by actual measurements at the project site. Any discrepancies between the drawings and specifications and the existing conditions shall be referred to the Owner for adjustment before any work affected thereby has been performed.

13.3 LABORATORY TESTS

13.3.1 Any specified laboratory tests of material and finished articles to be incorporated in the work shall be made by bureaus, laboratories or agencies approved by the Owner and reports of such tests shall be submitted to the Owner. The cost of the testing shall be paid for by the Contractor.

13.3.2 The Contractor shall furnish all sample materials required for these tests and shall deliver same without charge to the testing laboratory or other designated agency when and where directed by the Owner.

13.4 ARCHAEOLOGICAL EVIDENCE

13.4.1 Whenever, in the course of construction, any archaeological evidence is encountered on the surface or below the surface of the ground, the Contractor shall notify the authorities of the Delaware Archaeological Board and suspend work in the immediate area for a reasonable time to permit those

authorities, or persons designated by them, to examine the area and ensure the proper removal of the archaeological evidence for suitable preservation in the State Museum.

13.5 GLASS REPLACEMENT AND CLEANING

13.5.1 The General Contractor shall replace without expense to the Owner all glass broken during the construction of the project. If job conditions warrant, at completion of the job the General Contractor shall have all glass cleaned and polished.

13.6 WARRANTY

13.6.1 For a period of two (2) years from the date of substantial completion, as evidenced by the date of final acceptance of the work, the contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect of equipment, material or workmanship performed by the contractor or any of his subcontractors or suppliers. However, manufacturer's warranties and guarantees, if for a period longer than two (2) years, shall take precedence over the above warranties. The contractor shall remedy, at his own expense, any such failure to conform or any such defect. The protection of this warranty shall be included in the Contractor's Performance Bond.

ARTICLE 14: TERMINATION OF CONTRACT

14.1 If the Contractor defaults or persistently fails or neglects to carry out the Work in accordance with the Contract Documents or fails to perform a provision of the Contract, the Owner, after seven days written notice to the Contractor, may make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor. Alternatively, at the Owner's option, and the Owner may terminate the Contract and take possession of the site and of all materials, equipment, tools, and machinery thereon owned by the Contractor and may finish the Work by whatever method the Owner may deem expedient. If the costs of finishing the Work exceed any unpaid compensation due the Contractor, the Contractor shall pay the difference to the Owner.

14.2 “If the continuation of this Agreement is contingent upon the appropriation of adequate state, or federal funds, this Agreement may be terminated on the date beginning on the first fiscal year for which funds are not appropriated or at the exhaustion of the appropriation. The Owner may terminate this Agreement by providing written notice to the parties of such non-appropriation. All payment obligations of the Owner will cease upon the date of termination. Notwithstanding the foregoing, the Owner agrees that it will use its best efforts to obtain approval of necessary funds to continue the Agreement by taking appropriate action to request adequate funds to continue the Agreement.”

END OF SECTION 00 81 13

EMPLOYEE DRUG TESTING REPORT FORM

Period Ending:_____

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds submit Testing Report Forms to the Owner no less than quarterly.

Project Number: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____
_____
_____

Number of employees who worked on the jobsite during the report period:_____

Number of employees subject to random testing during the report period:_____

Number of Negative Results _____ Number of Positive Results _____

Action taken on employee(s) in response to a failed or positive random test:
_____
_____
_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

EMPLOYEE DRUG TESTING
REPORT OF POSITIVE RESULTS

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds to notify the Owner in writing of a positive random drug test.

Project Number: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____
_____
_____

Name of employee with positive test result: _____

Last 4 digits of employee SSN: _____

Date test results received: _____

Action taken on employee in response to a positive test result:
_____
_____
_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

This form shall be sent by mail to the Owner within 24 hours of receipt of test results.

Enclose this test results form in a sealed envelope with the notation "Drug Testing Form – DO NOT OPEN" on the face thereof and place in a separate mailing envelope.

SECTION 03 01 30 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removal of deteriorated concrete and subsequent replacement and patching.
2. Floor joint repair.
3. Epoxy crack injection.
4. Corrosion-inhibiting treatment.
5. Polymer overlays.
6. Polymer sealers.
7. Composite structural reinforcement.

B. Related Requirements:

1. Section 05 12 00 - Structural Steel Framing, for concrete repair with structural steel framing.
2. Section 05 50 00 - Metal Fabrications, for concrete repair with steel framing and fabricated devices.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

B. Samples: Cured samples for each exposed product and for each color and texture specified, in manufacturer's standard size appropriate for each type of work.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers and manufacturers.

B. Material Certificates: For each type of portland cement and aggregate supplied for mixing or adding to products at Project site.

C. Product Test Reports: For each manufactured bonding agent, cementitious patching mortar, joint-filler, crack injection, adhesive, polymer overlay, polymer sealer, and composite structural reinforcement, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

E. Maintenance Program: Submit before work begins.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Each manufactured bonding-agent, cementitious patching-mortar, joint-filler, crack-injection-adhesive, polymer-overlay, polymer-sealer, and composite-structural-reinforcement manufacturer shall employ factory-trained technical representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar materials, epoxy crack injection materials, corrosion-inhibiting treatments, polymer overlays, polymer sealers, and composite structural reinforcement.

C. Maintenance Program: Prepare a written plan for maintenance of cast-in-place concrete, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during the Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

B. Store cementitious materials off the ground, under cover, and in a dry location.

C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.8 FIELD CONDITIONS

A. Environmental Limitations for Epoxies: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.

1. Use only Class A epoxies when substrate temperatures are below or are expected to go below 40 deg F within 8 hours.

2. Use only Class A or B epoxies when substrate temperatures are below or are expected to go below 60 deg F within 8 hours.
3. Use only Class C epoxies when substrate temperatures are above and are expected to stay above 60 deg F for 8 hours.

B. Cold-Weather Requirements for Cementitious Materials: Comply with the following procedures:

1. When air temperature is below 40 deg F , heat patching-material ingredients and existing concrete to produce temperatures between 40 and 90 deg F.
2. When mean daily air temperature is between 25 and 40 deg F, cover completed Work with weather-resistant insulating blankets for 48 hours after repair or provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.
3. When mean daily air temperature is below 25 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.

C. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F and above.

D. Environmental Limitations for High-Molecular-Weight Methacrylate Sealers: Do not apply when concrete surface temperature is below 55 deg F or above 75 deg F. Apply only to dry substrates that have been dry for at least 72 hours.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain each color, grade, finish, type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

2.2 BONDING AGENTS

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Construction Chemicals - Building Systems; Emaco P24.
b. Euclid Chemical Company (The), an RPM company; Duralprep A.C.
c. Kaufman Products, Inc.; Surepoxy HM EPL.
d. Sika Corporation, Construction Product Division; Armatec 110 EpoCem.
e. Sto Corp., Concrete Restoration Division; Sto Bonding and Anti-Corrosion Agent.
f. Or approved equal.

B. Epoxy Bonding Agent: ASTM C 881/C 881M, Type II and free of VOCs.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dayton Superior Corporation; Superior Concrete Bonder (J-41).
b. Euclid Chemical Company (The), an RPM company; Euco Weld.
c. Kaufman Products, Inc.; Sureweld.
d. US SPEC, Division of US MIX Products Company; Bondcoat PVA.
e. W. R. Meadows, Inc.; Intralok.
f. Or approved equal.

C. Latex Bonding Agent: ASTM C 1059/C 1059M, Type II at structural and exterior locations and where indicated, Type I at other locations.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Latex Bonding Agent, Type I (Redispersible):

1) Dayton Superior Corporation; Superior Concrete Bonder (J-41).
2) Euclid Chemical Company (The), an RPM company; Euco Weld.
3) Kaufman Products, Inc.; Sureweld.
4) US SPEC, Division of US MIX Products Company; Bondcoat PVA.
5) W. R. Meadows, Inc.; Intralok.
6) Or approved equal.

b. Latex Bonding Agent, Type II (Non-Redispersible):

1) Dayton Superior Corporation; Conspec Strong Bond.
2) Euclid Chemical Company (The), an RPM company; Akkro-7T.
3) Kaufman Products, Inc.; Surebond.
4) US SPEC, Division of US MIX Products Company; US Spec Acrylcoat.
5) W. R. Meadows, Inc.; Sealtight Acry-Lok.

6) Or approved equal.

D. Mortar Scrub Coat: Mix consisting of 1 part portland cement and 1 part fine aggregate complying with ASTM C 144 except 100 percent passing a No. 16 sieve.

2.3 PATCHING MORTAR

A. Patching Mortar, General:

1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
2. Color and Aggregate Texture: Provide patching mortar and aggregates of colors and sizes necessary to produce patching mortar that matches existing, adjacent, exposed concrete. Blend several aggregates if necessary to achieve suitable matches.
3. Coarse Aggregate for Patching Mortar: ASTM C 33, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.

B. Job-Mixed Patching Mortar: 1 part portland cement and 2-1/2 parts fine aggregate complying with ASTM C 144, except 100 percent passing a No. 16 sieve.

C. Cementitious Patching Mortar: Packaged, dry mix for repair of concrete.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. Dayton Superior Corporation; Superior Concrete Bonder (J-41).
b. Euclid Chemical Company (The), an RPM company; Euco Weld.
c. Kaufman Products, Inc.; Sureweld.
d. US SPEC, Division of US MIX Products Company; Bondcoat PVA.
e. W. R. Meadows, Inc.; Intralok.
f. Or approved equal.

2. Compressive Strength: Not less than 4,000 psi (27.6 MPa at 28 days when tested according to ASTM C 109/C 109M.

D. Rapid-Strengthening, Cementitious Patching Mortar: Packaged, dry mix for repair of concrete.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. Dayton Superior Corporation; Superior Concrete Bonder (J-41).
b. Euclid Chemical Company (The), an RPM company; Euco Weld.
c. Kaufman Products, Inc.; Sureweld.
d. US SPEC, Division of US MIX Products Company; Bondcoat PVA.
e. W. R. Meadows, Inc.; Intralok.
f. Or approved equal.

2. Compressive Strength: Not less than 1,000 psi (7.0 MPa within 3 hours when tested according to ASTM C 109/C 109M.

E. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix for repair of concrete and that contains a latex additive as either a dry powder or a separate liquid that is added during mixing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dayton Superior Corporation; Superior Concrete Bonder (J-41).
b. Euclid Chemical Company (The), an RPM company; Euco Weld.
c. Kaufman Products, Inc.; Sureweld.
d. US SPEC, Division of US MIX Products Company; Bondcoat PVA.
e. W. R. Meadows, Inc.; Intralok.
f. Or approved equal.

2. Compressive Strength: Not less than 4,000 psi (27.6 MPa at 28 days when tested according to ASTM C 109/C 109M.

2.4 PREPLACED CONCRETE MATERIALS

A. Preplaced Aggregate: Washed aggregate, ASTM C 33, Class 5S, with 95 to 100 percent passing a 1-1/2-inch sieve, 40 to 80 percent passing a 1-inch sieve, 20 to 45 percent passing a 3/4-inch sieve, 0 to 10 percent passing a 1/2-inch sieve, and 0 to 2 percent passing a 3/8-inch sieve.

B. Fine Aggregate for Grout: Fine aggregate according to ASTM C 33, but with 100 percent passing a No. 8 sieve, 95 to 100 percent passing a No. 16 sieve, 55 to 80 percent passing a No. 30 sieve, 30 to 55 percent passing a No. 50 sieve, 10 to 30 percent passing a No. 100 sieve, 0 to 10 percent passing a No. 200 sieve, and having a fineness modulus of 1.30 to 2.10.

C. Grout Fluidifier for Grout: ASTM C 937.

D. Pozzolans for Grout: ASTM C 618.

2.5 JOINT FILLER

A. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of at least 80 according to ASTM D 2240.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dayton Superior Corporation; Superior Concrete Bonder (J-41).
b. Euclid Chemical Company (The), an RPM company; Euco Weld.
c. Kaufman Products, Inc.; Sureweld.
d. US SPEC, Division of US MIX Products Company; Bondcoat PVA.

e. W. R. Meadows, Inc.; Intralok.
f. Or approved equal.

B. Color: Matching existing joint filler.

2.6 EPOXY CRACK-INJECTION MATERIALS

A. Epoxy Crack-Injection Adhesive: ASTM C 881/C 881M, Type IV at structural locations and where indicated, Type I at other locations; free of VOCs.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dayton Superior Corporation; Superior Concrete Bonder (J-41).
b. Euclid Chemical Company (The), an RPM company; Euco Weld.
c. Kaufman Products, Inc.; Sureweld.
d. US SPEC, Division of US MIX Products Company; Bondcoat PVA.
e. W. R. Meadows, Inc.; Intralok.
f. Or approved equal.

2. Capping Adhesive: Product manufactured for use with crack injection adhesive by same manufacturer.
3. Color: Provide epoxy crack-injection adhesive and capping adhesive that will blend with existing, adjacent concrete and will not stain concrete surface.

2.7 MIXES

A. General: Mix products, in clean containers, according to manufacturer's written instructions.

1. Do not add water, thinners, or additives unless recommended by manufacturer.
2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

B. Mortar Scrub Coat: Mix dry ingredients with enough water to provide consistency of thick cream.

C. Dry-Pack Mortar: Mix patching-mortar dry ingredients with just enough liquid to form damp cohesive mixture that can be squeezed by hand into a ball but is not plastic.

D. Concrete: Comply with Section 03 30 00, Cast-in-Place Concrete.

E. Grout for Use with Preplaced Aggregate: Proportion according to ASTM C 938. Add grout fluidifier to mixing water followed by portland cement, pozzolan, and fine aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Notify Contracting Officer 7 days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.

B. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.

C. Pachometer Testing: Locate at least three reinforcing bars using a pachometer, and drill test holes to determine depth of cover. Calibrate pachometer using depth of cover measurements, and verify depth of cover in removal areas using pachometer.

D. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

3.2 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.

B. Preparation for Removal of Deteriorated Concrete: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.

1. Verify that affected utilities have been disconnected and capped.
2. Inventory and record the condition of items to be removed for reinstallation or salvage.
3. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement, settlement, or collapse of construction being demolished and construction and finishes to remain.

C. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.

1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
2. Use only proven protection methods appropriate to each area and surface being protected.
3. Provide barricades, barriers, and temporary directional signage to exclude public from areas where concrete maintenance work is being performed.

4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance work.
5. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
6. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
7. Protect floors and other surfaces along haul routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.
9. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
10. Neutralize and collect alkaline and acid wastes for disposal off Contracting Officer's property.
11. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

D. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Contracting Officer immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.

1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

E. Concrete Removal:

1. Provide shoring, bracing, and supports as necessary. Strengthen or add new supports when required during progress of removal work. Do not overload structural elements with debris.
2. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.
3. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.
4. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch over entire removal area.
5. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least a 3/4-inch clearance around bar.
6. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.

7. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.
8. Thoroughly clean removal areas of loose concrete, dust, and debris.

F. Reinforcing-Bar Preparation: Remove loose and flaking rust from reinforcing bars by wire brushing until only tightly adhered light rust remains.

1. Where section loss of reinforcing bar is more than 25 percent, or 20 percent in two or more adjacent bars, cut bars and remove and replace. Remove additional concrete as necessary to provide at least 3/4-inch clearance at existing and replacement bars. Splice replacement bars to existing bars according to ACI 318 (ACI 318M) by lapping, welding, or using mechanical couplings.

G. Preparation of Floor Joints for Repair: Saw-cut joints full width to edges and depth of spalls, but not less than 3/4 inch deep. Clean out debris and loose concrete; vacuum or blow clear with compressed air.

3.3 APPLICATION

A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.

B. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Apply to reinforcing bars by stiff brush or hopper spray according to manufacturer's written instructions. Apply to reinforcing bars in two coats, allowing first coat to dry 2 to 3 hours before applying second coat. Allow to dry before placing patching mortar or concrete.

C. Epoxy Bonding Agent: Apply to reinforcing bars by brush, roller, or spray according to manufacturer's written instructions, leaving no pinholes or other uncoated areas. Place patching mortar or concrete while epoxy is still tacky. If epoxy dries, recoat before placing patching mortar or concrete.

D. Latex Bonding Agent, Type I: Apply to concrete by brush roller or spray. Allow to dry before placing patching mortar or concrete.

E. Latex Bonding Agent, Type II: Mix with portland cement and scrub into concrete surface according to manufacturer's written instructions. Place patching mortar or concrete while bonding agent is still wet. If bonding agent dries, recoat before placing patching mortar or concrete.

F. Mortar Scrub Coat for Job-Mixed Patching Mortar: Dampen repair area and surrounding concrete 6 inches beyond repair area. Remove standing water and apply scrub coat with a brush, scrubbing it into surface and thoroughly coating repair area. If scrub coat dries, recoat before placing patching mortar or concrete.

G. Slurry Coat for Cementitious Patching Mortar: Wet substrate thoroughly and then remove standing water. Scrub a slurry of neat patching mortar into substrate, filling pores and voids.

H. Placing Patching Mortar: Place as follows unless otherwise recommended in writing by manufacturer:

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.
3. Pretreatment: Apply specified bonding agent.
4. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
5. Vertical Patching: Place material in lifts of not more than1 inch nor less than 1/8 inc. Do not feather edge.
6. Overhead Patching: Place material in lifts of not more than 1 inch nor less than 1/8 inch. Do not feather edge.
7. Consolidation: After each lift is placed, consolidate material and screed surface.
8. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.
9. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a smooth surface with a wood or sponge float.
10. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than 7 days by water-fog spray or water-saturated absorptive cover.

I. Dry-Pack Mortar: Use for deep cavities and where indicated. Place as follows unless otherwise recommended in writing by manufacturer:

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.
3. Pretreatment: Apply specified bonding agent.
4. Place dry-pack mortar into cavity by hand, and compact tightly into place. Do not place more material at a time than can be properly compacted. Continue placing and compacting until patch is approximately level with surrounding surface.
5. After cavity is filled and patch is compacted, trowel surface to match profile and finish of surrounding concrete. A thin coat of patching mortar may be troweled into the surface of patch to help obtain required finish.
6. Wet-cure patch for not less than 7 days by water-fog spray or water-saturated absorptive cover.

J. Concrete: Place according to Section 03 30 00, Cast-in-Place Concrete, and as follows:

1. Pretreatment: Apply epoxy-modified, cementitious bonding and anticorrosion agent to reinforcement and concrete substrate.
2. Pretreatment: Apply to concrete substrate.
3. Standard Placement:

    a. Use vibrators to consolidate concrete as it is placed.

b. At unformed surfaces, screed concrete to produce a surface that when finished with patching mortar will match required profile and surrounding concrete.

4. Form-and-Pump Placement: Place concrete by form and pump method.

a. Design and construct forms to resist pumping pressure in addition to weight of wet concrete. Seal joints and seams in forms and where forms abut existing concrete.
b. Pump concrete into place from bottom to top, releasing air from forms as concrete is introduced. When formed space is full, close air vents and pressurize to 14 psi (96 kPa).

5. Wet-cure concrete for not less than 7 days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.
6. Fill placement cavities with dry-pack mortar and repair voids with patching mortar. Finish to match surrounding concrete.

K. Floor-Joint Repair: Cut out deteriorated concrete and reconstruct sides of joint with patching mortar as indicated on Drawings. Install joint filler in nonmoving floor joints where indicated and as follows:

1. Depth: Install joint filler to a depth of at least 3/4 inch. Use fine silica sand no more than 1/4 inch deep to close base of joint. Do not use sealant backer rods or compressible fillers below joint filler.
2. Top Surface: Install joint filler so that when cured, it is flush at top surface of adjacent concrete. If necessary, overfill joint and remove excess when filler has cured.

L. Epoxy Crack Injection:

1. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond, and clean cracks with oil-free compressed air or low-pressure water to remove loose particles.
2. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.
3. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch thick by 1 inch wider than crack.
4. Inject cracks wider than 0.003 inch to a depth of 8 inches.
5. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.
6. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Packaged, Cementitious Patching Mortar: 3 randomly selected sets of samples for each type of mortar required, tested according to ASTM C 928.
2. Job-Mixed Patching Mortar: 3 randomly selected sets of samples for each type of mortar required, tested for compressive strength according to ASTM C 109/C 109M.
3. Concrete: As specified in Section 03 30 00, Cast-in-Place Concrete.
4. Grouted Preplaced Aggregate: Tested for compressive strength of grout according to ASTM C 942.

    a. Testing Frequency: One sample for each 25 cu. yd. of grout or fraction thereof, but not less than one sample for each day's work.

5. Joint Filler: Core-drilled samples to verify proper installation.

    a. Testing Frequency: One sample for each 100 feet of joint filled.
    b. Where samples are taken, refill holes with joint filler.

6. Epoxy Crack Injection: Core-drilled samples to verify proper installation.

    a. Testing Frequency: 3 samples from mockup and 1 sample for each 100 feet of crack injected.
    b. Where samples are taken, refill holes with epoxy mortar.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 03 01 30

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A Section Includes:

1 Provide formwork for cast-in-place concrete provided under Section 03.
2 Provide permanent corrugated metal forms noted at cast-in-place concrete stoops and other concrete slabs supported by foundation walls.
3 Provide shoring, bracing, anchorage, form ties, corner forms, and other appurtenances associated with formwork provided under this Section.
4 Provide formed metal construction joints where noted.
5 Provide dovetail anchor slots where masonry units tie into or are a veneer over cast-in-place concrete vertical elements.
6 Provide flashing reglets noted to be cast into cast-in-place concrete.
7 Provide waterstops noted to be cast into cast-in-place concrete.

B Related Sections:

1 Section 03 20 00 Concrete Reinforcing.
2 Section 03 30 00 Cast-In-Place Concrete.
3 Section 04 20 00 Unit Masonry.
4 Section 32 13 00 Rigid Paving.

1.2 REFERENCES

A American Concrete Institute (ACI):

1 ACI 117, Standard Specification for Tolerances for Concrete Construction and Materials
2 ACI 301, Specifications for Structural Concrete For Buildings
3 ACI 47R, Guide to Formwork for Concrete

B U.S. Products Standard PS-1

C American Plywood Association (APA)

1 Design and Construction Guide - Concrete Forming (1999)

1.3 DEFINITIONS

A Rough Formed Concrete Finish: Formed surfaces permanently concealed from view.

B Smooth Formed Concrete Finish: Exposed non-coated vertical concrete surfaces which are not exposed to public view in as-cast state, such as walls of tunnels and utility type

areas.

C Coated Concrete: Formed concrete surface that is required to provide a bond to an applied coating, such as plaster, waterproofing, or coatings 1/8-inch thick or greater.

D Architectural Formed Concrete Finish:

1 Formed surfaces prominently exposed to public view in the as-cast state and where appearance is of major importance.
2 Exposed non-coated vertical concrete surfaces shall be considered architectural concrete, unless otherwise specifically noted.

E Mechanically Textured Concrete: Formed surfaces which are to be mechanically finished to produce a special affect.

1.4 QUALITY ASSURANCE

A Installer Qualifications:

1 Provide a person continuously during concrete operations who is thoroughly familiar with requirements of Contract Documents, trained and experienced in type of concrete construction to be provided on this Project, and who is responsible for directing concrete work.
2 Use adequate number of skilled workers to ensure proper installation of concrete work.

B Regulatory Requirements: Meet requirements of applicable building codes and requirements of code authorities having jurisdiction related to concrete formwork installation and removal.

C Standard for Design and Construction: Meet applicable requirements of latest edition of ACI documents specified, except where more stringent requirements are specified or noted on Drawings.

D Engineered Formwork: Where formwork and shoring is complex or restraining significant loads, formwork shall be designed by a licensed professional engineer retained by the Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

A Packing and Shipping: Handle materials to prevent damage.

B Storage and Protection of Formwork: Store materials above ground, on framework or blocking, covered with protective waterproof covering which provides adequate air circulation and ventilation.

PART 2 - PRODUCTS

1.1 FORM MATERIALS

A General Requirements for Form Materials:

1 Forms For Rough Concrete: Lumber or plywood as specified or as applicable for each installation condition.
2 Forms For Smooth Concrete: Overlaid plywood.
3 Forms For Coated Concrete: Overlaid plywood.
4 Forms For Formed Finish Architectural Concrete: Steel, glass fiber reinforced plastic, or overlaid plywood.
5 Forms For Mechanically Textured Concrete: Glass fiber reinforced plastic or overlaid plywood.
6 Forms For Cylindrical Columns, Pedestals, and Supports: Metal, glass fiber reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding following specified surface class per ACI 347R. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
7 Pan and Dome Type Forms: Glass fiber reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

1.2 WOOD FORM MATERIALS

A Lumber Forms: Surfaced 4 sides (S4S).

B Plywood Forms:

1 Forms For Rough Concrete: Plywood which meets the requirements of U.S. Product Standard PS-1, B-B, exterior grade, mill-oiled and edge-sealed, with each piece bearing the APA grade trademark.
2 Forms For Smooth Concrete: Overlaid plywood which meets the requirements of U.S. Product Standard PS-1 exterior grade and edge-sealed, with each piece bearing the APA grade trademark. Wood species may be most economical and plywood need not be sanded before overlay application.
3 Forms For Coated Concrete: Presanded Douglas Fir overlaid plywood with laminate or medium density contact face which meets the requirements of U.S. Product Standard PS-1 with each edge-sealed and bearing APA grade trademark as manufactured by Simpson “A-Matte FormGuard” or equal.

4 Forms For Formed Finish Architectural Concrete: Overlaid plywood having a laminate of high density or medium density contact face applied to Douglas Fir plywood which complies with requirements of U.S. Product Standard PS-1, with each piece edge-sealed and bearing the APA grade trademark as manufactured by Simpson “Regular FormGuard” for large project, or Simpson “A-Matte FormGuard” for small projects, or equal.
5 Forms For Mechanically Textured Concrete: Overlaid plywood with laminate overlay contact face applied to Douglas Fir plywood which meets the requirements of U.S. Product Standard PS-1 with each piece edge-sealed and bearing APA grade trademark as manufactured by Simpson “Premium FormGuard” or equal.

1.3 PREFABRICATED FORMS

A Permanent Corrugated Metal Forms (Form Deck or Conform Deck):

1 Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or Owner approved equal:

a Vulcraft, Division of Nucor Corporation, Norfolk, NE, Type 1, of gauge indicated on Drawings

2 Equivalent Products of Following Manufacturers Are Acceptable:

a Epic Metals Corporation, Rankin, PA
b Steel Dynamics, Inc., Butler, IN
c United Steel Deck, Inc., Summit, NJ
d Wheeling Corrugating Co., Div. of Wheeling-Pittsburgh Steel Corp., Wheeling, WV

3 Description: Corrugated galvanized steel sheets, of weight required to support total load without excessive deflection.

a Provide deck types and gauges as noted on Drawings.

B Steel Forms: Well matched, tight fitting, and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finish concrete surfaces.

C Glass Fiber Reinforced Plastic Forms: Forms matched, tight fitting, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surface.

D Round Fibre Forms:

1 Acceptable Manufacturer: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or Owner approved equal:

a Sonoco Products Company, “Sonovoid Fibre Tubes”

2 Description:

a Fibre tubes of spiral construction, with sufficient wall thickness to handle load of concrete, with moisture barrier in walls of tubes, exterior and interior surfaces wax treated for weather and moisture protection.
b Adhesive used in tube construction shall be a non-water-sensitive type.

E Pan and Dome Forms:

1 Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or Owner approved equal:

a Fiberglass Forms:

i Bergan Built, Inc.
ii Ceco
iii Interform
iv MFG

b Steel Forms:

i Ceco

2 General Requirements:

a Forms for waffle pattern and pan and joist systems shall be fiberglass or steel.
b Contractor shall be responsible for whichever type form used, to provide a finished structural system satisfactory to Architect.
c Contractor shall be certain there will be no added dead loads or insufficient steel covering which could cause deformation of forms.
d Fins, voids or defacement of any kind shall be allowed only inasmuch as they will be unnoticed after finish called for on Drawings is applied.

1.4 FORM ACCESSORIES

A Anchorages: Nails, spikes, lag bolts, through bolts, and other anchorages shall be of size required and of sufficient strength and character to maintain formwork in place while pouring concrete.

B Form Ties:

1 Provide factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent deflection and prevent spalling of concrete surfaces upon removal.
2 Provide ties with no corrodible metal portion remaining within concrete, after removal of exterior parts, which are less than 1 inch from exposed concrete surface.
3 Provide form ties which will leave a hole no larger than 1-inch diameter in concrete surface.

C Form Release Agent: A commercial product which will not stain concrete or impair natural bonding or color characteristics of coating intended for use on concrete.

D Corner Formers:

1 Radius Corner Formers: Rigid foam plastic, 3/4-inch radius, maximum possible

length.

2 Triangular Chamfer Formers: Rigid foam plastic, approximately 1/2-inch by 1/2-inch by 3/4-inch face dimension, maximum possible lengths.

1.5 CONCRETE ACCESSORIES

A Formed Metal Construction Joints:

1 Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or Owner approved equal:

a Heckmann Building Products, Inc., No. 95

2 Materials: 20 gauge galvanized steel.

3 Description: Tongue and groove profile with knockout holes at 30 inches on center to receive doweling, complete with anchorage.

B Dovetail Anchor Slots:

1 Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or Owner approved equal:

a Heckmann Building Products, Inc.

2 Materials: Minimum 22 gauge galvanized steel.

3 Description: Foam filled, modified channel shaped slot for use with dovetail anchors to attach masonry to cast-in-place concrete.

C Flashing Reglet:

1 Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or Owner approved equal:

a Heckmann Building Products, Inc., “No. 234, Stay-Put Flashing Reglet”

2 Description: Reglet shall be 26 gauge galvanized steel with a foam filler or taped face 1/4-inch throat by 1-inch slot by 1 1/4-inch slope, with flange edges turned 1/4-inch into concrete for permanent anchorage.

D Waterstop:

1 Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or Owner

approved equal:

a Greenstreak, Inc., “Style 703"
b Vinylex Corporation, “No. RB6-38”
c W.R. Meadows, Inc., “No. 6316”

2 Description: 4 inches wide, ribbed, center bulbed, maximum possible lengths.

a Rubber waterstops shall meet requirements of Corps of Engineers Specification CRD-C513.

b Vinyl waterstops shall meet requirements of Corps of Engineers Specification CRD-C572.

PART 3 - EXECUTION

1.1 EXAMINATION

A Verification of Conditions: Examine substrate, ground, supporting members, and conditions under which concrete formwork is to be performed.

B Correction of Deficiencies: Do not proceed with work until unsatisfactory conditions have been corrected.

1.2 FORMWORK DESIGN REQUIREMENTS

A Design to Support Loads:

1 Design, support, brace, and maintain formwork, in accordance with ACI 301, to safely support vertical, lateral, static, dynamic, and construction loads that might be applied until loads can be supported by concrete structure.
2 Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength.

B Design to Maintain Safety of Structure: Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, temporary construction material, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.

C Removability: Design formwork to be removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

D Form Leakage:

1 Provide formwork sufficiently tight to minimize leakage of cement paste during concrete placement.

2 Solidly butt joints and provide back-up materials at joints to minimize leakage and fins.

E Forms For Exposed Concrete:

1 Ties: Drill forms to suit ties used and to prevent leakage of concrete material around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

2 Patching Forms:

a Do not use metal cover plates for patching holes or defects in forms.
b Do not use “patched” forms for exposed concrete surfaces, unless acceptable by Architect.

3 Corners: Provide sharp, clean corners, without visible edges of offsets, at intersecting planes. Back joints with extra studs or girts to maintain true, square intersections.
4 Bracing: Use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips to form material which will produce bow.
5 Form Removal: Assemble forms to be readily removed without damage to exposed concrete surfaces.
6 Formed Shapes: Form molding shapes, recesses, and projections with smooth-finish materials and install them with sealed joints to prevent displacement.

F Corner Treatment:

1 Concealed Corners: Concealed corners may be formed square, rounded, or chamfered.

a Chamfered Corners: Form chamfers with strips, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.

2 Exposed Corners: Form exposed corners of concrete elements to produce square, smooth, solid, unbroken lines, unless otherwise indicated.

G Joints:

1 Provide control and construction joints, including wood screeds, metal keyways, and sawcuts.
2 Locate where indicated on Drawings.

H Provisions for Other Trades:

1 Openings Required By Others: Provide openings in concrete formwork to

accommodate work of other trades and contracts, if any. Size and location of openings, recesses, and chases are the responsibility of parties requiring such openings.

2 Built-In Items Required By Others: Accurately place and securely support items to be built into forms.

1.3 FORM CONSTRUCTION

A Standard of Workmanship:

1 Construct forms in accordance with ACI 117, 301 and 347R, to sizes, lines, and dimensions shown and as required to obtain accurate alignment, location, and grades.

2 Limit concrete irregularities in accordance with ACI 347 as follows:

a Exposed Surfaces (Architectural Concrete): 1/2 inch.

b Unexposed Surfaces: Class B, 1/4 inch.

3 Level and plumb work in finished structures.

4 Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required that are applicable to the Work.

5 Use selected materials to obtain required finishes.

B Form Fabrication:

1 Fabricate forms for removal without hammering or prying against concrete surfaces.

2 Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

3 Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.

4 Kerf wood inserts for forming keyways, reglets, and recesses to prevent swelling and ensure ease of removal.

C Temporary Openings:

1 Provide temporary openings where interior area of formwork is inaccessible for cleanout and inspection before concrete placement.

2 Provide openings at base of columns and along bottom of wall forms.

3 Locate temporary openings in an inconspicuous location and not over 7 feet on center for wall forms.

4 Close temporary openings with tight fitting panels which are flush with inside face of forms and neatly fit so joints will not be apparent in exposed concrete surface.

D Falsework: Erect falsework and support, brace, and maintain it to safely support vertical, lateral, and asymmetrical loads applied to falsework until such loads can be supported by in-place concrete structure.

E Shoring:

1 Provide shores and struts, with positive means of adjustment, capable of taking up formwork settlement during concrete placing operations using wedges or jacks or a combination of both.
2 Provide trussed supports when adequate foundations for shores and struts cannot be secured.

F Form Face Support:

1 Support forms, by structural members spaced sufficiently close and for sufficient stiffness, to limit deflection to L/360 for exposed concrete and L/240 for unexposed concrete.
2 Support panel edges to avoid variations between panels.
3 Fit forms placed in successive units, for continuous surfaces, to accurate alignment, free from irregularities, and within allowable tolerances.
4 Form Edge Sealing: Edge-seal plywood forming materials with an effective water excluding coating, including at cut-outs, holes, and field cuts.

1.4 ADJUSTING FORMS

A Retightening Forms: Retighten forms immediately after concrete placement to eliminate mortar leaks.

B Inspecting Forms:

1 Carefully inspect falsework and formwork, during and after concrete placement operations, to determine abnormal deflection or signs of failure.
2 Make necessary adjustments to provide work of required dimensions.

1.5 CLEANING FORMS

A General Requirements: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just prior to concrete being placed.

B Cleaning Forms in Cold Weather:

1 During cold weather, remove ice and snow from within forms.
2 Do not use de-icing salts.
3 Do not use water to clean out completed forms, unless formwork and concrete construction proceed within heated enclosure.
4 Use compressed air or other means to remove foreign matter.

1.6 FORM COATINGS AND RELEASE AGENTS

A Application:

1 Apply form release agent before reinforcement is placed.

2 Do not allow excess agent to accumulate in forms, or come in contact with reinforcement or concrete surfaces which will be bonded to fresh concrete.

B Compatibility of Coatings:

1 Where form coating is used, form coating supplier shall verify that product is compatible with release agent.
2 Use chemically active type release agents that will not bond with, stain, nor adversely affect concrete surfaces, and that will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compound.

C Manufacturer's Instructions: Apply form coatings and release agents in accordance with product manufacturer’s recommendations.

1.7 INSTALLATION OF EMBEDDED ITEMS, INSERTS, AND OPENINGS

A Forming Openings: Provide formed openings where required for pipes, conduits, sleeves, and other work embedded in and passing through cast-in-place concrete.

B Placing Cast Items: Locate and set in place items to be cast directly into concrete.

C Coordination With Others:

1 Coordinate work of other Specification Sections and cooperate with trades involved in forming and setting of openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
2 Do not perform work unless it has been specifically indicated on Drawings or has been reviewed prior to installation.

D Installation of Concrete Accessories:

1 Install concrete accessories in accordance with manufacturer’s recommendations.
2 Install accessories straight, level, and plumb.
3 Ensure that items are not disturbed during concrete placement.

E Installation of Vinyl Waterstops:

1 Install continuous waterstops without displacing reinforcement.
2 Install waterstops in maximum practical length pieces to hold number of joints to a minimum.
3 Make joints so they will develop effective watertightness equal to continuous waterstop material and so they will develop not less than 50 percent of mechanical strength of parent section and permanently retain flexibility.

F Installation of Construction Joints:

1 Place formed construction joints to provide a strip cast pattern pouring sequence for concrete floor slabs-on-grade.

2 Provide a keyed type construction joint at edges of each separate section.
3 Space joints not more than 30 feet on center.
4 Set top of construction joints/screeds at required elevations and secure to resist movement by wet concrete.

1.8 FORM REMOVAL

A Architect's Notification: Notify Architect prior to removing formwork.

B Form Removal Restrictions:

1 Do not remove forming, shoring, and bracing as applicable to Project until concrete has gained sufficient strength to carry its own weight, and construction and design loads which are liable to be imposed upon it.
2 Verify strength of concrete by test results.
3 Supported concrete shall attain a minimum compressive strength of 100 percent of the 28-day strength prior to form removal; verify through field cured cylinders. Contractor shall coordinate with Owner’s independent testing laboratory for number of field cured cylinders and testing dates associated with field cured cylinders.

C Removal Procedure: Remove formwork progressively and in accordance with code requirements so that no shock loads or unbalanced loads are imposed on structure.

D Loosening Forms:

1 Loosen forms carefully.
2 Do not wedge pry bars, hammers or tools against concrete surfaces.

E Architect's Review: Leave forms loosely in place against vertical surfaces for protection until complete removal is reviewed by Architect.

F Form Storage:

1 Store removed forms for exposed architectural concrete in such a manner that surfaces to be in contact with fresh concrete will not be damaged.
2 Marked or scored forms will be rejected.

G Reshoring:

1 Reshore structural members as required.
2 Remove load supporting forms only when concrete has attained required 28-day compressive strength.

H Removal of Forms For Non-Structural Concrete: Remove forms not directly supporting weight of concrete as soon as stripping operations will not damage concrete.

1.9 REUSE OF FORMS

A Preparing Forms for Reuse:

1 Clean, remove irregularities, and repair surfaces of forms to be reused in Work.
2 Split, frayed, delaminated or otherwise damaged form facing materials will not be acceptable for use at concrete surfaces to be exposed in completed work.
3 Apply new form release compound material to concrete contact surfaces as specified for new formwork.

B Extended Forms:

1 When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitances, and tighten forms to close joints.
2 Align and secure joints to avoid offsets.

1.10 FIELD QUALITY CONTROL

A Field Quality Control - Formwork:

1 Inspect and report on concrete formwork tolerances required by ACI 347R, Section 3.
2 Verify layout of work and check general building lines and levels established.
3 Coordinate layout and measurements, and if discrepancies arise, promptly report them to Architect in writing.
4 As applicable to Work, inspect installed formwork, shoring, and bracing to ensure that work is in accordance with design requirements, and that supports, fastenings, wedges, ties, and other items are secure.

END OF SECTION 03 10 00

SECTION 03 15 00 – CONCRETE ACESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A Section Includes: Cast-in and drilled in anchors for concrete.

B Related Sections:

1 Division 3 Concrete Sections.
2 Division 4 Masonry Sections.
3 Division 5 Metals Sections.

2.1 SUBMITTALS

A General: Submit in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

1 Product specifications with recommended design values and physical characteristics for epoxy dowels, expansion and undercut anchors.
2 Samples: Representative length and diameters of each type anchor shown on the Drawings.
3 Quality Assurance Submittals:

a Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
b Certificates:

i ICC ES Evaluation Reports.

4 Manufacturer's installation instructions.
5 Installer Qualifications & Procedures: Submit installer qualifications as stated in Section 1.03.B. Submit a letter of procedure stating method of drilling, the product proposed for use, the complete installation procedure, manufacturer training date, and a list of the personnel to be trained on anchor installation.

B Closeout Submittals: Submit the following:

1 Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals Section.

3.1 QUALITY ASSURANCE

A Installer Qualifications:

1 Drilled-in anchors shall be installed by a contractor or installer with at least three years of experience performing similar installations.

B Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the contractor or installer on the project. Training to consist of a review of the complete installation process for drilled-in anchors, to include but not limited to:

1 hole drilling procedure
2 hole preparation & cleaning technique
3 adhesive injection technique & dispenser training / maintenance
4 rebar dowel preparation and installation
5 proof loading/torquing

C Certifications: Unless otherwise authorized by the Engineer, anchors shall have one of the following certifications:

1 ICC ES Evaluation Report indicating conformance with current applicable ICC ES Acceptance Criteria.

4.1 DELIVERY, STORAGE AND HANDLING

A General: Comply with Division 1 Section - Product Storage and Handling Requirements.

1 Store anchors in accordance with manufacturer's recommendations.

PART 2 – PRODUCTS

1.1 MATERIALS

A Fasteners and Anchors:

1 Bolts and Studs: ASTM A307; ASTM A449 where "high strength" is indicated on the Drawings.
2 Carbon and Alloy Steel Nuts: ASTM A563.
3 Carbon Steel Washers: ASTM F436.
4 Carbon Steel Threaded Rod: ASTM A36; or ASTM A193 Grade B7; or ISO 898 Class 5.8.
5 Wedge Anchors: ASTM A510; or ASTM A108.
6 Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.
7 Stainless Steel Nuts: ASTM F594.
8 Zinc Plating: ASTM B633.

9 Hot-Dip Galvanizing: ASTM A153.
10 Metric Anchor Bolts, Screws, and Studs: ISO 898 Part 1.
11 Metric Anchor Nuts: EN 24033.
12 Metric Anchor Stainless Steel Bolts, Screws, and Studs: ISO 3506 Part 1.
13 Metric Anchor Stainless Steel Nuts: ISO 3506 Part 2.
14 Reinforcing Dowels: ASTM A615

2.1 CAST-IN-PLACE BOLTS

A Anchors, Bolts, Nuts, and Washers: Bolts and studs, nuts, and washers shall conform to ASTM

B A307, Grade A, and ASTM A449, ASTM A563, and ASTM F436, as applicable. Hot-dip galvanized bolts and studs including associated nuts and washers in accordance with ASTM A153.

3.1 DRILLED-IN ANCHORS

A Wedge Anchors: Wedge type, torque-controlled, with impact section to prevent thread damage complete with required nuts and washers. Provide anchors with length identification markings conforming to ICC ES AC01 or ICC ES AC193. Type and size as indicated on Drawings.

1 Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
2 Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 and Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Stainless steel nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
3 Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:

a Hilti Kwik Bolt 3, ICC ESR-1385 and ESR-2302.
b Hilti Kwik Bolt TZ, ICC ESR-1917 (carbon steel and AISI Type 304 Stainless Steel).

B Screw Anchors: screw type. Pre-drilling of the hole requires a standard ANSI drill bit with the same diameter as the anchor and installing the anchor will be done with an impact wrench. Provide anchors with a diameter and anchor length marking on the head. Type and size as indicated on Drawings.

1 Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating equivalent to DIN EN ISO 4042.

2 Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:

a Hilti Kwik-HUS-EZ, ICC-ESR 3027.

C Heavy Duty Metric Sleeve Anchors: Torque-controlled, exhibiting follow-up expansion under load, with provision for rotation prevention during installation. Type and size as indicated on Drawings.

1 Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors manufactured from materials conforming to ISO 898 Part 1, with zinc plating equivalent to ASTM B633, Type III Fe/Zn 5.

2 Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be manufactured from materials conforming to ISO 3506 Part 1 and having corrosion resistance equivalent to AISI Type 304 and Type 316 stainless steel. Stainless steel anchors shall be provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ISO 3506 Part 2 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

3 Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:

a Hilti HSL, HSLG, or HSLB.

D Heavy Duty Metric Undercut Anchors: Bearing-type. Installed anchor shall have a minimum tension bearing area in the concrete, measured as the horizontal projection of the bearing surface, not less than two times the net tensile area of the anchor bolt. The installed anchor shall exhibit a form fit between the bearing elements and the undercut in the concrete. Type and size as indicated on Drawings.

1 Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors manufactured from materials conforming to ISO 898 Part 1, with zinc plating equivalent to ASTM B633, Type III Fe/Zn 5.

2 Exterior Use: As indicated on the Drawings, provide sherardized or stainless steel anchors. Sherardized anchors shall be manufactured from materials conforming to ISO 898 Part 1 and having corrosion resistance equivalent to ASTM A153 with sherardized dry diffusion zinc coating. Stainless steel anchors shall be manufactured from materials conforming to ISO 3506 Part 1 and having corrosion resistance equivalent to AISI Type 316 stainless steel. Stainless steel anchors shall be provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ISO 3506 Part 2 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

3 Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:

a Hilti HDA, ICC ESR-1546.

E Cartridge Injection Adhesive Anchors: Threaded steel rod, inserts or reinforcing dowels, complete with nuts, washers, polymer or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on Drawings.

1 Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel threaded rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) [or carbon steel HIT TZ rods conforming to ASTM A510 with chemical composition of AISI 1038].

2 Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 and Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

3 Reinforcing dowels shall be A615 Grade 60.

a HIT-HY 200 Safe Set System using Hilti Hollow Drill Bit and VC 20/40 vacuum System for anchorage to concrete, ICC ESR-3187.

4 Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:

a Hilti HAS threaded rods with HIT-HY 200 Safe Set System using Hilti Hollow Drill Bit and VC 20/40 vacuum System for anchor and rebar anchorage to concrete, ICC ESR-3187.

F Capsule Anchors: Threaded steel rod, inserts and reinforcing dowels with 45-degree chisel point, complete with nuts, washers, glass or foil capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, and manufacturer's installation instructions. Type and size as indicated on Drawings.

1 Interior Use: Unless otherwise indicated on the Drawings, provide chisel-pointed carbon steel rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).

2 Exterior Use: As indicated on the Drawings, provide chisel-pointed stainless steel anchors. Stainless steel anchors shall be AISI Type 304 and Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to

ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

3 Reinforcing dowels shall be A615 Grade 60, with 45-degree chisel-points at embedded end.

4 Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide the following:

a Hilti HVA Adhesive System with HVU capsules.

PART 3 – EXECUTION

1.1 INSTALLATION

A Cast-In-Place Bolts: Use templates to locate bolts accurately and securely in formwork.

B Drilled-In Anchors:

1 Drill holes with rotary impact hammer drills using carbide-tipped bits, hollow drill bit system, or core drills using diamond core bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.

a Cored Holes: Where anchors are permitted to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Properly clean cored hole per manufacturer's instructions.

b Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

c Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

2 Perform anchor installation in accordance with manufacturer instructions.

3 Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not

achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.

4 Cartridge Injection Adhesive Anchors: Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

5 Capsule Anchors: Perform drilling and setting operations in accordance with manufacturer instructions. Clean all holes to remove loose material and drilling dust prior to installation of adhesive. Remove water from drilled holes in such a manner as to achieve a surface dry condition. Capsule anchors shall be installed with equipment conforming to manufacturer recommendations. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

6 Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

2.1 REPAIR OF DEFECTIVE WORK

A Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

3.1 FIELD QUALITY CONTROL

A Testing: 10% of each type and size of drilled-in anchor shall be proof loaded by the independent testing laboratory. Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Engineer. If more than 10 of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Engineer.

1 Tension testing should be performed in accordance with ASTM E488.
2 Torque shall be applied with a calibrated torque wrench.
3 Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.

B Minimum anchor embedment's, proof loads and torques shall be as shown on the Drawings.

END OF SECTION 03 15 00

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED SECTIONS

1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
2 Section 03 10 00 – Concrete Forming and Accessories.
3 Section 03 30 00 - Cast-in-Place Concrete.

2.1 REFERENCES

A American Concrete Institute (ACI)

1 SP-66, ACI Detailing Manual, 2004.

B American Society for Testing and Materials International (ASTM)

1 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
2 ASTM A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
3 ASTM A1022/A1022M, Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement.

3.1 SUBMITTALS

A Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Owner's Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada . SP-66, ACI Detailing Manual, 2004, American Concrete Institute.

B Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.

C Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador.

PART 2 - PRODUCTS

1.1 MATERIALS

A Substitute different size bars only if permitted in writing by Owner's Representative.

B Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

C Cold-drawn annealed steel wire ties: to ASTM A497/A497M.

D Welded steel wire fabric: to ASTM A185/A185M. Provide in flat sheets only.

E Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

F Mechanical splices: subject to approval of Owner's Representative.

G Plain round bars: to CSA-G40.20/G40.21.

2.1 FABRICATION

A Fabricate reinforcing steel in accordance with CSA-A23.1A23.2, SP-66, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

B Obtain Owner's Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

C Upon approval of Owner's Representative, weld reinforcement in accordance with CSA W186.

D Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

3.1 SOURCE QUALITY CONTROL

A Upon request, provide Owner's Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.

B Upon request inform Owner's Representative of proposed source of material to be supplied.

PART 3 - EXECUTION

1.1 FIELD BENDING

A Do not field bend or field weld reinforcement except where indicated or authorized by Owner's Representative.

B When field bending is authorized, bend without heat, applying a slow and steady pressure.

C Replace bars which develop cracks or splits.

2.1 PLACING REINFORCEMENT

A Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1/A23.2.

B Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

C Prior to placing concrete, obtain Owner's Representative approval of reinforcing material and placement.

D Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION 03 20 00

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Cast-in-place concrete.

C. Related Sections:

1. Section 031000 - Formwork
2. Section 031500 - Concrete Accessories
3. Section 032000 - Concrete Reinforcement

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. American Concrete Institute (ACI):

1. ACI 211.1 Proportioning Concrete Mixtures
2. ACI 301 Specifications for Structural Concrete
3. ACI 303.1 Specification for Cast-in-Place Architectural Concrete
4. ACI 305 Hot Weather Concreting
5. ACI 306 Specifications for Cold Weather Concreting
6. ACI 308 Specifications for Curing Concrete

7. ACI 309 Consolidation of Concrete
8. ACI 318 Building Code Requirements for Structural Concrete

C. American Society for Testing and Material (ASTM)

1. ASTM C31 Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C33 Specification for Concrete Aggregates
3. ASTM C94 Specification for Ready Mix Concrete
4. ASTM C143 Test Method for Slump of Hydraulic Concrete
5. ASTM C150 Specification for Portland Cement
6. ASTM C156 Standard Test Method for Water Retention by Liquid Membrane Forming Curing Compounds for Concrete
7. ASTM C171 Specification for Sheet Materials for Curing Concrete
8. ASTM C172 Practice for Sampling Freshly Mixed Concrete
9. ASTM C260 Specifications for Air Entraining Admixtures for Concrete
10. ASTM C309 Specification for Liquid Membrane - Forming Compounds for Curing Concrete
11. ASTM C330 Specification for Lightweight Aggregates for Structural Concrete
12. ASTM C494 Specification for Chemical Admixtures for Concrete
13. ASTM C567 Test Method for Determining Density of Structural Lightweight Concrete
14. ASTM C618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
15. ASTM C881 Specification for Epoxy - Resin - Base Bonding Systems for Concrete
16. ASTM E1745 Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs

D. American Association of State Highway and Transportation Officials (AASHTO):

1. M182-60 - Burlap Cloth Made for Jute or Kelat

E. State of California - California Department of Transportation (CALTRANS):

1. CMM Materials Manual.
2. Standard Specifications.

F. American Institute of Steel Construction (AISC):

1. Code of Standard Practice for Steel Buildings and Bridges

1.3 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements."

B. Product Data: Provide data form proprietary materials, including admixtures curing materials, and finish materials.

C. Submit Placement Shop Drawings, showing location of construction joints, clearly indicate the construction joints in different locations that those shown in the Drawings.

D. Samples: As requested by Testing Laboratory.

E. Mix design for each concrete mix sealed by an engineer registered in California.

1. Include compression test data used to establish mix proportions.

F. Submit certification that the facilities of the ready-mix plant comply with the requirements of ASTM C94.

G. Material Certificates.

1. Cementitious materials, including supplemental cementitous material.
2. Aggregates, including gradation and combined gradation.
3. Admixtures. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.

H. Submit ticket to Testing Laboratory for each batch of concrete delivered, bearing the following information. Refer to "Field Quality Control" Article of this Section.

1. Mix identification.
2. Weights of cementitious materials, aggregates, water and admixtures, and aggregate size.

I. Submit test reports from the independent testing agency for review by the University.

J. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

   a. Include statement indicating costs for each product having recycled content.
2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements and for equivalent concrete mixtures that do not contain portland cement replacements.

1.4 QUALITY ASSURANCE

A. Quality assurance and inspection shall be in accordance with Division 01 Section "Special Provisions".

B. Standards: Comply with provisions of ACI 301, except where more stringent requirements are indicated. Evaluation and acceptance of concrete structures will be in accordance with ACI 301.

C. Concrete Mix Design: Testing Laboratory shall, under direction of its California registered Civil Engineer, design concrete mixes. Each mix shall bear the signature, seal and registration expiration date of the engineer directing the design work. For mixes containing greater than twenty-five percent fly ash, the Testing Laboratory shall produce calculations and test batches in accordance with the recommendations of ACI 211.1 to determine the minimum water content and to confirm workability, curing time and compressive strength.

D. Certificates of Compliance: Acceptability of the following materials will be based upon documentation furnished by the manufacturer identifying each batch of material and certifying compliance with the requirements specified:

1. Portland cement.
2. Fly ash.
3. Chemical admixtures.

E. Certified Laboratory Test Reports: Before delivery of materials submit certified copies of the reports of the tests required in referenced standards or otherwise specified here. The testing shall have been performed by an independent laboratory approved by the University within one year of submittal of test reports for approval. Test reports on a previously tested material shall be accompanied by notarized certificates from the manufacturer certifying that the previously tested material is of the same type, quality, manufacture and make as that proposed for use in the Project. Certified test reports are required for the following:

1. Portland Cement.
2. Aggregates.
3. Admixtures.

F. Survey anchor bolts for placement and alignment prior to casting concrete.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious materials and aggregates for exposed concrete shall be from same source throughout the work.

B. Cementitious Material: An intimate blend of Portland cement and supplemental cementitious material. Cementitious material shall include 15 percent minimum to a maximum of 25 percent fly

ash or ground blast furnace slag by weight unless the strength is specified to be achieved in 7 or 14 days. Cementitious material shall comply with ACI 318 Chapter 4 requirements for exposure class S1.

C. <Retain first option in first paragraph below if required for LEED-NC Credit ID 1.1. This credit can be achieved by replacing at least 40 percent of the portland cement, which would otherwise be used in concrete, with other cementitious materials. Retain second option if limiting percentage of cementitious materials that can replace portland cement. Neither ACI 301 nor ACI 318 (ACI 318M) limit amount of cementitious materials that can replace portland cement unless concrete is exposed to deicing chemicals. Identify parts of building or structure affected by these limits unless extending them to all concrete.

D. Supplemental Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

E. Aggregate for Standard Weight Concrete: ASTM C33, except as modified herein.

1. Coarse Aggregates: Cleanness Value of not less than 75 when tested as per CMM-Test Method No. California 227.
2. Coarse Aggregate for Shrinkage Controlled Concrete: Lonestar or Hanson Clayton, or Sechelt, B.C. (as supplied by Hanson).
3. Fine Aggregates: Sand Equivalent of not less than 75 when tested per CMM-Test Method No. California 217.

F. Aggregate for Lightweight Concrete: ASTM C330. Lightweight aggregate shall be vacuum saturated expanded shale or clay produced by rotary kiln.

G. Water: Mixing water shall be clean, potable and free from deleterious material.

H. Admixtures

1. General:
   a. Admixtures containing more than 0.05 percent chloride ions are not permitted.
   b. Where mix contains more than one admixture, all admixtures shall be supplied by one manufacturer. Manufacturer shall certify that admixtures are compatible such that desirable effects of each admixture will be realized.
   c. Liquid admixtures shall be considered part of the total water.

I. Lightweight Concrete shall contain an air entrainment admixture conforming to ASTM C260, to produce an air content of 3 to 5 percent at point of placement.

J. Water Reducing Admixture: ASTM C494, Type A. Provide in all concrete at necessary dosage to facilitate placement.

K. Mid to High Range Water Reducing Admixture: ASTM C494, Type F; polycarboxylate formulation. Provide in mid-range or high-range dosage as necessary for placement at the maximum water to cement ratio specified.

L. Set Accelerating Admixture: ASTM C494, Type E, non-chloride. Subject to approval of University's Representative, provide in necessary dosage to accelerate set.

M. Set Retarding Admixture: ASTM C494, Type D. Subject to approval of University's Representative, provide in necessary dosage to retard set.

N. Color Admixtures: ASTM C579; products of Davis Colors, L. M. Scofield Co, QC Construction Products, or equal. Provide color as approved by the University's Representative from job site samples. Exposed exterior concrete shall contain 2 pounds of lampblack per cubic yard.

2.2 ACCESSORIES

A. Curing Compounds: ASTM C309, Type I, clear or translucent without dye or Type 2, white pigmented and which will not discolor concrete or affect bonding of other finishes applied thereover, and which restricts loss of water to not more than 0.500 grams per square centimeter of surface when tested per ASTM C156, “Test Method for Water Retention by Concrete Curing Materials.”

B. Slab Curing Membrane: Membrane conforming to ASTM C171, non-staining.

C. Burlap Sheet: AASHTO M182, class 3 or 4.

D. Surface Hardener: Lapidolith, Hornolith, Kemi-Kal Liquid or equal.

E. Rock Base: Clean, hard and durable gravel or crushed rock conforming to the requirements of CalTrans Standard Specifications Section 68 for Class 1, Type A permeable material.

F. Vapor Barrier: ASTM D2103, “Polyethylene Film and Sheeting.”

G. Sand Cover: Uniformly graded, clean sand free from excessive fines, organic materials or other deleterious substances.

H. Form Tie Cone Hole Plugs: Burke Co., Grey, Recessed, Jumbo Cone, “Snaplug”, or equal (no known equal) with waterproof adhesive.

I. Filter drains such as behind concrete walls: Type A drain rock conforming to Division 31 Section "Backfilling" or prefabricated drain manufactured with polyethylene stranded or molded core and a geotextile fabric bonded to one side. Filter drains shall be manufactured by Mirafi, Exxon or equal approved by the Architect-Engineer.

J. Embedded Reglets and Dovetail Anchor Slots: 18 gauge galvanized steel.

K. Bonding Agent: Burke Acrylic Bondcrete, Thorobond or equal.

2.3 CONCRETE MIXES

A. Schedule of Concrete Classes:

Mix ID/Use	Aggregate Size	Slump	Min. Strength	Other Req'ts
Mix A Drilled Piers, Foundations	Size 57 (1 inch) (25 mm)	4 to 6 inches (100 to 150 mm)	4000 psi (27.6 MPa)	
Mix B Walls, Columns, Suspended Slabs & Beams	Size 57 (1 inch) (25 mm)	4 to 6 inches (100 to 150 mm)	4000 psi (27.6 MPa)	Req't E.1, Req't E.2
Mix C Floor Slabs on Grade, Miscellaneous Concrete	Size 57 (1 inch) (25 mm)	3 to 5 inches (75 to 125 mm)	4000 psi (27.6 MPa)	Req't E.1, Req't E.2
Mix D Lightweight Concrete Fill on Metal Decking	1/2 inch (13 mm) by #4 lightweight	3 to 5 inches (75 to 125 mm)	4000 psi (27.6 MPa)	Req'ts E.2 and E.3
Mix E Miscellaneous concrete for curbs, pads, etc.	Size 57 (1 inch) (25 mm)	3 to 5 inches (75 to 125 mm)	3500 psi (24.1 MPa)	
Lean Concrete	Size 57 (1 inch) (25 mm)	3 to 5 inches (75 to 125 mm)	1500 psi (10.3 MPa)	

B. Aggregate: Coarse aggregate size number in accordance with ASTM C33 for normal-weight aggregate. Coarse aggregate size in accordance with ASTM C330 for lightweight aggregates.

C. Slump: Minimum-maximum slump at point of placement in inches when tested in accordance with ASTM C143.

D. Strength: Minimum compressive strength in psi after 28 days, tested in accordance with ASTM C39.

E. Other Requirements (apply only where indicated in Schedule of Concrete Mixes)

1. Shrinkage Controlled Concrete: Use special coarse aggregates specified. Select materials and proportion mix to achieve shrinkage less than 0.040 percent (ASTM C157 modified).
2. Water to Cementitious Material Ratio: Mixes "B","C" and "D" shall have a water-to-cementitious-material ratio not exceeding 0.45 by weight. Weight of water shall include all free moisture, including liquid admixtures. Mixes shall contain specified high range water reducing admixture at mid-range dosage as required to achieve specified slump.
3. Lightweight Concrete: Equilibrium weight at 100 days air dry of 113 pcf plus or minus 3 pcf, ASTM C567. Mix shall contain 4 percent, plus or minus 1 percent, entrained air by volume at point of placement.

F. Proposed mixes shall produce concrete to strengths specified with adequate workability and proper consistency to permit concrete to be worked into forms and around reinforcement without excessive segregation or bleeding.

G. Mix design shall be subject to review by the University's Representative and the Testing Laboratory. Submit mixes in a timely manner to allow for review and adjustment, if necessary.

H. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

I. Concrete mixes used for liquid nitrogen tank foundations shall comply with ACI 318 Chapter 4 requirements for exposure class F1.

J. For any concrete mix that uses greater than 45% total cementitious material the maximum water-cement ratio shall not exceed 0.38.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 01 Section "General Provisions".

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchor bolts, embedded plates, reinforcement, sleeves and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 FORMWORK ERECTION

A. Verify lines, levels, and measurement before proceeding with formwork.

B. Hand trim sides and bottom of earth forms; remove loose dirt.

C. Align form joints.

D. Do not apply form release agent to concrete surfaces which receive [special finishes] [or] [applied coatings] that may be affected by agent.

1. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

3.3 REINFORCEMENT AND EMBEDDED ITEMS

A. Place, support, and secure reinforcement and embedded items against displacement.

B. Installation tolerances for anchor bolts for structural steel columns shall comply with the AISC Code of Standard Practice for Steel Buildings and Bridges requirements for tolerances.

C. Only items that are dimensionally located on the drawings may be embedded in concrete regardless of the trade responsible for placing them.

3.4 PLACING CONCRETE

A. Notify the University at least 48 hours prior to commencement of concreting operations. No concrete shall be placed until all subgrade, formwork, reinforcing steel, embedded items and surfaces against which concrete is to be placed have been accepted by the University. The rate of delivery, haul time, missing time and hopper capacity shall be such that all mixed concrete delivered shall be placed in forms within 90 minutes from the time of the introduction of cement and water into the mixer. No water shall be added after transit mixer leaves the batching plant without the approval of the University.

B. Prepare previously placed concrete by cleaning with steel brush or sandblasting and applying bonding agent in accordance with manufacturer's instruction.

C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout or epoxy grout.

D. Foundation surfaces against which concrete is to be placed must be free from standing water, mud and debris. Surfaces shall be clean and free from oil, objectionable coatings, and loose or unsound material.

E. All surfaces of forms and embedded items shall be free of grout before placing concrete.

F. Install joint fillers and waterstops in accordance with manufacturer's instructions. Install 1/2-inch thick joint filler to separate slabs on grade from vertical surfaces. Extend joint filler from bottom of slab to within ¼-inch of finished slab surface.

G. Locate construction joints where indicated on the Structural Drawings.

H. When ambient temperature is expected to exceed 80 degrees F during placing or finishing operations, steps shall be taken in accordance with ACI 305, "Recommended Practices for Hot Weather Concreting", to reduce concrete temperature and water evaporation by proper attention to the ingredients, production methods, handling, placing, protection and curing. The Subcontractor shall submit a detailed hot weather concrteting procedure to the A/E for approval at least two business days before concrete placement is planned. The Subcontractor's testing agency will produce trial batches in accordance with ACI 305. Slabs will be fog sprayed from the completion of skreeding until curing is begun; the fog spray may be discontinued on sections during troweling.

3.5 FLOOR SLABS

A. Place floor slabs in long strip patterns. Saw cut control joints at an optimum time after finishing. Cut slabs with a 3/16-inch thick blade to 1 inch depth.

B. Separate slabs on grade from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within ¼ inch of finished slab surface.

C. Nonslip finish surfaces.

D. Install joint devices and joint device anchors in accordance with manufacturer's instructions. Maintain correct position to allow joint cover flush with floor finish.

E. Construct slab on grade and shored elevated floor slabs with overall specified F_F30/F_L20 and with minimum F_F15/F_L10 for individual floor sections in accordance with ACI 302.1. Determination of F_F/F_L numbers will be in accordance with ASTM E 1155. The Subcontractor will take remedial measures when floor slabs do not meet specified requirements The Subcontractor's plan for remedial measures shall be submitted to the University for review and approval.

3.6 SCHEDULE OF FORMED SURFACES

A. Smooth surface finish at < Insert locations >.

B. Rough form finish at < Insert locations >.

C. Smooth form finish at < Insert locations >.

D. Smooth rubbed finish at < Insert locations >.

E. Cement slurry finish at < Insert locations >.

3.7 CURING AND PROTECTION

A. The requirements of this section may be modified only by the Structural Engineer of Record (SER) for the design. In those cases where the Structural Engineer of record is under subcontract to the Laboratory, approval by a Laboratory Structural Engineer is required prior to modification of the requirements of this section.

B. Wheeling, working and walking on concrete shall be avoided for at least 24 hours after casting. Protect concrete from sun and rain. Do not permit concrete to become dry during curing period. Concrete shall not be subjected to any loads until concrete is completely cured, and until concrete has attained its 28 day strength and 28 days minimum.

C. Protect concrete during and after curing from damage during subsequent building construction operations.

D. Cover traffic areas with plywood or other suitable means for as long as necessary to protect concrete from damage.

E. Specific curing requirements for slabs shall include the following: Immediately upon completion of finishing operation, the surface of slabs shall be sealed against moisture loss by the application of a curing blanket made of polyetheylene bonded to burlap in accordance with the manufacturer's instructions. Alternatively, waterproof curing paper may be used with edges lapped and sealed with tape. The curing membrane shall be weighted down. Tears and rips in curing membrane shall be repaired immediately during curing period. Curing shall be maintained for 21 days.

F. Specific curing requirements for walls, beams and columns shall include the following: Concrete in forms shall be kept moist until removal. Immediately upon removal of forms, an approved sprayed-on curing compound shall be applied to the concrete surfaces in strict compliance with the manufacturer's recommendations. Curing shall be maintained for 14 days.

G. For above grade concrete sections over three feet thick in all three orthogonal directions except lean concrete:

1. Ten days before placing concrete, the results of thermal test performed by the Subcontractor will be submitted to the University for approval. Thermal tests shall consist of a three foot test cube of the design mix for the thick section instrumented with thermocouples by the Subcontractor's testing agency and monitored to determine whether the heat of hydration exceeds 150 deg F (66 deg C). If the temperature exceeds 150 deg F (66 deg C) , the mix design will be revised or standard aggregate cooling utilized and a second test cube cast and tested at no additional cost to the University.
2. The temperature gradient between the center and the surface of the section must not exceed 20 deg F (6.6 deg C) during the first ten days of the controlled curing period. Thermocouples shall be installed by the Subcontractor's testing agency in the center and six inches from the surface at twenty foot intervals and at the corners. The thermocouples are to be monitored continuously by the Subcontractor's testing agency and, if the temperature gradient exceeds 20 deg (6.6 deg C), insulating blankets shall be placed over the surface. On surfaces with protruding reinforcing, such as the top of a wall, loose insulation will be used.

3.8 FIELD QUALITY CONTROL

A. Inspection and Testing will be performed under provisions of Division 01.

B. Testing Laboratory will:

1. Collect and review tickets for each batch of concrete delivered. Annotate water or admixtures added subsequent to batching.
2. Special Inspect concrete placement, as required by CBC Section [1701.5, Item 1], for conformance with the Contract Documents.
3. Slump: ASTM C143; one test at point of placement at start of each day's pour; additional tests when concrete consistency appears to have changed.
4. Compressive Strength: Test concrete for compressive strength in accordance with CBC Section [[1905.6]]and ASTM C39. Conform to testing frequency of CBC [1905.6.1]. Take 4 specimens per sample, test one at seven days, two at 28 days, and retain one specimen.
5. Temperature: ASTM C1064; one test hourly. Take additional tests where warranted by weather conditions or delays in delivery.
6. Air Content: ASTM C173; for mixes with more than 3 percent air, take one test hourly at point of placement.

C. The Subcontractor will be responsible for all Testing Laboratory costs for investigating low-strength compressive test results in accordance with CBC Section 1905.6.5.

END OF SECTION 03 30 00

SECTION 04 01 10 - MASONRY CLEANING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2.1 SUMMARY

A. Section includes cleaning the following:

1. Unit masonry surfaces.

3.1 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi (690 kPa).

4.1 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to cleaning masonry including, but not limited to, the following:

a. Verify masonry-cleaning equipment and facilities needed to make progress and avoid delays.
b. Materials, material application, and sequencing.
c. Cleaning program.
d. Coordination with building occupants.

5.1 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry-cleaning work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.

5. Where water repellents are to be used on or near masonry, delay application of these chemicals until after cleaning.

6.1 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include material descriptions and application instructions.
2. Include test data substantiating that products comply with requirements.

7.1 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paint-remover manufacturer and chemical-cleaner manufacturer.

B. Preconstruction Test Reports: For cleaning materials and methods.

C. Cleaning program.

8.1 QUALITY ASSURANCE

A. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

C. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage.

1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness for this Project.

D. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.

a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

9.1 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage one or more chemical-cleaner and paint-remover manufacturers to perform preconstruction testing on masonry surfaces.

1. Use test areas as indicated and representative of proposed materials and existing construction.
2. Propose changes to materials and methods to suit Project.

10.1 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.

B. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

1.1 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.

D. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.

E. Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Basis of Design is Diedrich Technologies Inc., a division of Sandell Construction Solutions; Diedrich 101 Masonry Restorer, or Diedrich 101G Granite, Terra Cotta, & Brick Cleaner or Diedrich 200 Lime Solv.

2.1 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABR Products, Inc.; ABR Rubber Mask.
    b. Price Research, Ltd.; Price Mask.
    c. PROSOCO, Inc.; Sure Klean Strippable Masking.

3.1 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended in writing by chemical-cleaner manufacturer.

B. Acidic Cleaner Solution for Nonglazed Masonry: Dilute acidic cleaner with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended in writing by chemical-cleaner manufacturer.

PART 3 - EXECUTION

1. MASONRY-CLEANING SPECIALIST

2. PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

    a. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous

surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

b. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.

c. Neutralize alkaline and acid wastes before disposal.

d. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3. CLEANING MASONRY, GENERAL

A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 10 feet away by Architect.

B. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.

C. Use only those cleaning methods indicated for each masonry material and location.

a. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.

b. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.

1. Equip units with pressure gages.
2. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a coneshaped spray.
3. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
4. For high-pressure water-spray application, use fan-shaped spray that disperses water at an angle of at least 40 degrees.
5. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
6. For steam application, use steam generator capable of delivering live steam at nozzle.

D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.

E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.

F. Water Application Methods:

a. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.

b. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

G. Steam Cleaning: Apply steam to masonry surfaces at the very low pressures indicated for each type of masonry. Hold nozzle at least 6 inches from masonry surface and apply steam in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

H. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

I. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

a. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

J. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

4. PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar.

a. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
b. Remove paint and calking with alkaline paint remover.

1. Comply with requirements in "Paint Removal" Article.
2. Repeat application up to two times if needed.

5. 3.5 CLEANING MASONRY

A. Cold-Water Soak:

a. Apply cold water by intermittent spraying to keep surface moist.
b. Use perforated hoses or other means that apply a fine water mist to entire surface being cleaned.
c. Apply water in cycles of five minutes on and 20 minutes off.
d. Continue spraying until surface encrustation has softened enough to permit its removal by water wash, as indicated by cleaning tests for 72 hours.
e. Remove soil and softened surface encrustation from surface with cold water applied by low-pressure spray.

B. Cold-Water Wash: Use cold water applied by low-pressure spray.

C. Hot-Water Wash: Use hot water applied by low-pressure spray.

D. Steam Cleaning: Apply steam at very low pressures not exceeding 30 psi (207 kPa). Remove dirt softened by steam with wood scrapers, stiff-nylon or -fiber brushes, or cold-water wash, as indicated by cleaning tests.

E. Detergent Cleaning:

a. Wet surface with cold or hot water applied by low-pressure spray.
b. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
c. Rinse with cold or hot water applied by low-pressure spray to remove detergent solution and soil.
d. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

F. Mold, Mildew, and Algae Removal:

a. Wet surface with cold or hot water applied by low-pressure spray.

b. Apply mold, mildew, and algae remover by brush or low-pressure spray.
c. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.
d. Rinse with cold or hot water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
e. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

G. Acidic Chemical Cleaning:

a. Wet surface with cold water applied by low-pressure spray.
b. Apply cleaner to surface in two applications by brush or low-pressure spray.
c. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer.
d. Rinse with cold water applied by low-pressure spray to remove chemicals and soil. Rinse until all foaming, if any, stops and suds disappear.
e. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

6. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives for consultation and Project-site inspection and provide on-site assistance when requested by Architect. Have paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives visit Project site not less than once to observing progress and quality of the work.

7. FINAL CLEANING

A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.

B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 04 01 10

SECTION 04 01 20 - MAINTENANCE AND CLEANING OF UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Work shall comply with the "Secretary of the Interiors Standards for Rehabilitation" (http://www.nps.gov/tps/standards/four-treatments/treatment-rehabilitation.htm), specifically in regards to:

1. "Assessing Cleaning and Water-Repellant Treatments for Historical Masonry Buildings" (Preservation Brief 1; http://www.nps.gov/tps/how-to-preserve/briefs/1-cleaning-water-repellent.htm)
2. "Repointing Mortar Joints in Historical Masonry Buildings" (Preservation Brief 2; http://www.nps.gov/tps/how-to-preserve/briefs/2-repoint-mortar-joints.htm).

1.2 SUMMARY

A. Section includes maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:

1. Repairing unit masonry, including replacing units.
2. Repointing joints.
3. Preliminary cleaning, including removing plant growth.
4. Cleaning exposed unit masonry surfaces.
5. Paint removal from masonry surfaces.

B. Related Sections:

1. Section 04 20 00, Unit Masonry.

1.3 DEFINITIONS

A. Spray Pressure Classifications:

1. Very Low-Pressure Spray: Under 100 psi.
2. Low-Pressure Spray: 100 to 300 psi, 4 to 6 gpm.

3. Medium-Pressure Spray: 301 to 700 psi; 4 to 6 gpm.
4. High-Pressure Spray: 701 to 1100 psi; 4 to 6 gpm.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Provisions for expansion joints or other sealant joints.

C. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data for:

a. Restoration Specialist.
b. Restoration Worker Qualifications.
c. Paint remover manufacturer and chemical cleaner manufacturer.

B. Cleaning Program.

1.6 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Engage an experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.

1. At Contractor's option, work may be divided between two specialist firms: One for cleaning work and one for repair work.
2. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
3. Restoration Worker Qualifications: Persons who are experienced in restoration work of types they will be performing.

B. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.

1. Provide units to match existing brickwork.
2. New face brick material to be as specified in Section 04 20 00, Unit Masonry.
3. Field blend new face brick to match existing blend adjacent to repair area. Where a single brick is to be replaced, use new brick of matching color.
4. Special Shapes:

a. Provide specially molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
b. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are not acceptable procedures for fabricating special shapes.

B. Building Brick: Provide building brick complying with ASTM C 62, Grade SW where in contact with earth, Grade SW, MW, or NW for concealed backup; and of same vertical dimension as face brick, for masonry work concealed from view.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray where required for color matching of exposed mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Sand: ASTM C 144 unless otherwise indicated.

1. Provide natural sand of color necessary to produce required mortar color.
2. For pointing mortar, provide sand with rounded edges.
3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

E. Water: Potable, suitable for use in mortar.

2.3 MANUFACTURED REPAIR MATERIALS

A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.
b. Edison Coatings, Inc.; Custom System 45.
c. Other manufacturers of equivalent products acceptable to Architect.

2. Use formulation that is vapor and water permeable equal to or more than the masonry unit, exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
3. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched.

2.4 PAINT REMOVERS

A. (NONE REQUIRED)

2.5 CLEANING MATERIALS

A. Water: Potable, suitable for use in mortar.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gallons of solution required.

D. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 5 quarts of 5 percent sodium hypochlorite, and 15 quarts of hot water for every 5 gallons of solution required.

E. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Diedrich Technologies Inc.; Diedrich 910PM Polished Marble Cleaner.
    b. Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
    c. PROSOCO; Enviro Klean 2010 All Surface Cleaner.

F. Mild Acidic Cleaner: Manufacturer's standard mildly acidic cleaner containing no muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABR Products, Inc.; X-190 Limestone & Concrete Cleaner.
    b. Diedrich Technologies Inc.; Envirorestore 100.
    c. PROSOCO; Enviro Klean BioWash.

G. Acidic Cleaner: Not permitted.

2.6 ACCESSORY MATERIALS

A. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

2.7 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mortar Proportions: Mix mortar materials in the following proportions:

1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand. Add mortar pigments if necessary to produce mortar colors required.
2. Rebuilding (Setting) Mortar: Same as pointing mortar.
3. Rebuilding (Setting) Mortar: 1 part portland cement, 2 parts lime, and 6 parts sand.
4. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N unless otherwise indicated, cementitious material limited to portland cement and lime.

2.8 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Keep wall wet below area being cleaned to prevent streaking from runoff.

3.2 BRICK REMOVAL AND REPLACEMENT

A. Use of other than hand tools for brick removal is prohibited.

B. Remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

C. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.

F. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

G. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick size, texture, color, appearance, and strength. Do not use broken units unless they can be cut to usable size.

H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.
2. Use setting buttons or shims to set units accurately spaced with uniform joints.

I. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.3 MASONRY UNIT PATCHING

A. Patching Bricks:

1. Remove loose material from masonry surface. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.
2. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of masonry unit.
3. Mix patching compound in individual batches to match each unit being patched.
4. Rinse surface to be patched and leave damp, but without standing water.
5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
8. Keep each layer damp for 72 hours or until patching compound has set.

3.4 CLEANING MASONRY - GENERAL

A. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry. Equip units with pressure gages.
3. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
4. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water-Spray Application Method: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Chemical Cleaner Application Methods:

1. Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush application. Do not allow chemicals to remain on surface for periods longer than recommended by manufacturer.
2. Spray application is not permitted.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

3.5 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.

a. Comply with requirements in "Paint Removal" Article

2. Remove asphalt and tar with solvent-type paint remover.

a. Comply with requirements in "Paint Removal" Article.
b. Apply paint remover only to asphalt and tar by brush without prewetting.
c. Allow paint remover to remain on surface for 10 to 30 minutes.
d. Repeat application if needed.

3.6 PAINT REMOVAL

A. (NONE REQUIRED)

3.7 CLEANING MASONRY

A. Detergent Cleaning:

1. Wet masonry with hot water applied by low-pressure spray.
2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
3. Rinse with hot water applied by low-pressure spray to remove detergent solution and soil.

B. Mold, Mildew, and Algae Removal:

1. Wet masonry with hot water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush.
3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that masonry surface remains wet.
4. Rinse with hot water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.

C. Nonacidic Gel Chemical Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply nonacidic gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.
3. Let cleaner remain on surface for period indicated below:
   a. As recommended by chemical-cleaner manufacturer.
4. Remove bulk of nonacidic gel cleaner by squeegeeing into containers for disposal.
5. Rinse with hot water applied by low-pressure spray to remove chemicals and soil.

D. Nonacidic Liquid Chemical Cleaning:

1. Wet masonry with hot water applied by low-pressure spray.
2. Apply cleaner to masonry by brush. Let cleaner remain on surface for period recommended by chemical-cleaner manufacturer.
3. Rinse with hot water applied by low-pressure spray to remove chemicals and soil.

3.8 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. Joints where mortar is missing or where they contain holes.

2. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
3. Cracked joints where cracks are 1/16 inch or more in width and of any depth.
4. Joints where they sound hollow when tapped by metal object.
5. Joints where they are worn back 1/4 inch or more from surface.
6. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
7. Joints where they have been filled with substances other than mortar.
8. Joints indicated as sealant-filled joints.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, using procedures acceptable to Owner and Architect:

1. Remove mortar from joints to depth of 3/4 inch, or not less than that required to expose sound, unweathered mortar, but not less than 1/2 inch.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.

    a. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. This method is only allowable or necessary when a Portland cement joint needs to be removed, and starting in the middle then switching to hand tools. Remove remaining mortar by hand with chisel and resilient mallet.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
3. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
4. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.

a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.

5. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.9 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

END OF SECTION 04 01 20

SECTION 04 01 40 - MAINTENANCE OF STONE ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2.1 SUMMARY

A. Section includes maintenance of stone assemblies consisting of stone restoration and cleaning as follows:

1. Preliminary cleaning, including removing plant growth.
2. Cleaning exposed stone surfaces.
3. Salvaging and cleaning – cleaning procedures of stone

B. Related Sections:

1. Division 04 Section “Unit Masonry”

3.1 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm

D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm

E. Stone Terminology: ASTM C 119.

F. Face Bedding: Setting of stone with the natural bedding planes (strata) vertical and parallel to the wall plane rather than horizontal or "naturally bedded," which holds bedding planes together by gravity.

4.1 ACTION SUBMITTALS

A. LEED SUBMITTALS:

1. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

5.1 INFORMATIONAL SUBMITTALS

A. Qualification Data: For field supervisors and chemical-cleaner manufacturer.

B. Quality-Control Program.

C. Cleaning Program.

6.1 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Engage an experienced cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry or new stone masonry is not sufficient experience for stone restoration work.

    1. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that stone cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond control of restoration specialist firm.

B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

C. Source Limitations: Obtain each type of material for stone restoration (stone, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

D. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.

E. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.

    1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

F. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain

removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

G. Mockups: Prepare mockups of cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.

1. Cleaning: Clean an area approximately 25 sq. ft. for each type of stone and surface condition.

   a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
   b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to stone restoration and cleaning including, but not limited to, the following:

   a. Construction Schedule: Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Materials, material application, sequencing, tolerances, and required clearances.

7.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone units to Project site strapped together in suitable packs or pallets or in heavy-duty crates.

B. Deliver each piece of granite with code mark or setting number on unexposed face, corresponding to Shop Drawings, using nonstaining paint.

C. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

F. Store lime putty covered with water in sealed containers.

G. Store sand where grading and other required characteristics can be maintained and contamination avoided.

8.1 PROJECT CONDITIONS

A. Weather Limitations: Proceed with work only when existing and forecasted weather conditions permit cleaning to be performed according to manufacturers' written instructions and specified requirements.

B. Clean stone surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

9.1 SEQUENCING AND SCHEDULING

1. Perform stone restoration work in the following sequence:
    a. Remove plant growth.
    b. Remove paint.
    c. Clean stone surfaces.

PART 2 – PRODUCTS

1.1 STONE MATERIALS

A. Salvaged Stone: Obtain salvaged stone from locations shown on Drawings. Clean off residual mortar.

2.1 CLEANING MATERIALS

A. Water: Clean, non-alkaline, and Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

D. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

E. Nonacidic Gel Cleaner: Manufacturer's standard gel formulation, with pH between 6 and 9, that contains detergents with chelating agents and is specifically formulated for cleaning masonry surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Price Research, Ltd.; Price Marble Cleaner-Gel.
    b. PROSOCO; Sure Klean 942 Limestone and Marble Cleaner.

F. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Diedrich Technologies Inc.; Diedrich 910PM Polished Marble Cleaner.
    b. Dominion Restoration Products, Inc.; Bio-Cleanse.
    c. Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
    d. Price Research, Ltd.; Price Non-Acid Masonry Cleaner.
    e. PROSOCO; Enviro Klean 2010 All Surface Cleaner.

G. Mild Acidic Cleaner: Manufacturer's standard mildly acidic cleaner containing no muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Diedrich Technologies Inc.; Envirorestore 100.
    b. PROSOCO; Enviro Klean BioWash.

H. Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Diedrich Technologies Inc.; Diedrich 101 Masonry Restorer.
    b. Dumond Chemicals, Inc.; Safe n' Easy Heavy Duty Restoration Cleaner.
    c. PROSOCO; Enviro Klean Restoration Cleaner.

I. One-Part Limestone Cleaner: Manufacturer's standard one-part acidic formulation for cleaning limestone.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Price Research, Ltd.; Price Limestone Restorer.
    b. PROSOCO; Sure Klean Limestone Restorer.

J. Two-Part Limestone Cleaner: Manufacturer's standard system consisting of potassium or sodium hydroxide based, alkaline prewash cleaner and acidic afterwash cleaner that does not contain hydrofluoric acid.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Diedrich Technologies Inc.; Diedrich 707X Limestone Cleaner Pre-Rinse followed by 707N Limestone Neutralizer After-Rinse.

b. Price Research, Ltd.; Price Limestone Pre-Wash followed by Limestone AfterWash System.
c. PROSOCO; Enviro Klean BioKlean followed by Sure Klean Limestone & Masonry Afterwash.

3.1 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

B. Acidic Cleaner Solution for Unpolished Stone: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical-cleaner manufacturer. Use only on unpolished granite, unpolished dolomite marble, and siliceous sandstone.

C. Acidic Cleaner for Polished Stone: Dilute with water to concentration demonstrated by testing that does not etch or otherwise damage polished surface, but not greater than that recommended by chemical-cleaner manufacturer. Use only on polished granite and polished dolomite marble.

PART 3 - EXECUTION

1.1 PROTECTION

A. Protect persons, motor vehicles, building site, plants, and surrounding buildings from harm resulting from stone cleaning work.

B. Comply with chemical-cleaner manufacturer's written instructions for protecting surfaces against damage from exposure to its products. Prevent chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Do not clean stone during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
3. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
4. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

2.1 STONE REMOVAL

A. At locations indicated, remove stone that is to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding stone.

B. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.

C. Remove in an undamaged condition as many whole stone units as possible.

1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
3. Store stone for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.

D. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

E. Do not use broken units unless they can be cut to usable size.

F. Do not allow face bedding of stone. Before setting, inspect to verify that each stone has been cut so that, when it is set in final position, natural bedding planes are essentially horizontal. Reject and replace stone with vertical bedding planes except as required for arches, lintels, and copings.

3.1 CLEANING STONE, GENERAL

A. Proceed with cleaning in an orderly manner: Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each stone material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage stone.

    a. Equip units with pressure gages.

3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.

6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
7. For steam application, use steam generator capable of delivering live steam at nozzle.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging stone surfaces.

D. Water Application Methods:

1. Water-Soak Application: Soak stone surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of stone and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Steam Cleaning: Apply steam to stone surfaces at the very low pressures indicated for each type of stonework. Hold nozzle at least 6 inches from surface of stone and apply steam in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

F. F. Chemical-Cleaner Application Methods: Apply chemical cleaners to stone surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

G. Rinse off chemical residue and soil. Periodically during each rinse, test pH of rinse water Running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

H. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

4.1 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from stone surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil or debris from open joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of material from surface of stone with sharp chisel. Do not scratch or chip stone surface.
2. Remove paint and calking with alkaline paint remover.
    a. Comply with requirements in "Paint Removal" Article.
    b. Repeat application up to two times if needed.
3. Remove asphalt and tar with solvent-type paint remover.
    a. Comply with requirements in "Paint Removal" Article.
    b. Apply paint remover only to asphalt and tar by brush without prewetting.
    c. Allow paint remover to remain on surface for 10 to 30 minutes.
    d. Repeat application if needed.

5.1 CLEANING STONEWORK

A. Cold-Water Soak:
    1. Apply cold water by intermittent spraying to keep surface moist.
    2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
    3. Apply water in cycles with at least 30 minutes between cycles.
    4. Continue spraying until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
    5. Continue spraying for 72 hours.
    6. Remove soil and softened surface encrustation from stone with cold water applied by low-pressure spray.

B. Cold-Water Wash: Use cold water applied by low-pressure spray.

C. Hot-Water Wash: Use hot water applied by low-pressure spray.

D. Steam Cleaning: Apply steam at very low pressures not exceeding 30 psi. Remove dirt softened by steam with wood scrapers, stiff-nylon or -fiber brushes, or cold-water wash, as indicated by cleaning tests.

E. Detergent Cleaning:
    1. Wet stone with cold water applied by low-pressure spray.
    2. Scrub stone with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that stone surface remains wet.
    3. Rinse with cold water applied by low-pressure spray to remove detergent solution and soil.
    4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

F. Mold, Mildew, and Algae Removal:

1. Wet stone with cold water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub stone with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that stone surface remains wet.
4. Rinse with cold water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

G. Nonacidic Gel Chemical Cleaning:

1. Wet stone with cold water applied by low-pressure spray.
2. Apply nonacidic gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.
3. Let cleaner remain on surface for period indicated below:

    a. As recommended by chemical-cleaner manufacturer.

4. Remove bulk of nonacidic gel cleaner by squeegeeing into containers for disposal.
5. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

H. Nonacidic Liquid Chemical Cleaning:

1. Wet stone with hot water applied by low-pressure spray.
2. Apply cleaner to stone in two applications by brush or low-pressure spray. Let cleaner main on surface for period indicated below:

    a. As recommended by chemical-cleaner manufacturer.
    b. As established by mockup.

3. Rinse with hot water applied by pressure spray to remove chemicals and soil.

I. Acidic Chemical Cleaning:

1. Wet stone with cold water applied by low-pressure spray.
2. Apply cleaner to stone by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:

    a. As recommended by chemical-cleaner manufacturer.
    b. As established by mockup.

3. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.

4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

J. One-Part Limestone Chemical Cleaning:

1. Wet stone with cold water applied by low-pressure spray.
2. Apply cleaner to stone by brush or low-pressure spray. Let cleaner remain on surface for period recommended by chemical-cleaner manufacturer.
3. Immediately repeat application of one-part limestone cleaner as indicated above over the same area.
4. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil.

K. Two-Part Limestone Chemical Cleaning:

1. Wet stone with hot water applied by low-pressure spray.
2. Apply alkaline prewash cleaner to stone by brush or roller. Let cleaner remain on surface for period recommended by chemical-cleaner manufacturer unless otherwise indicated.
3. Rinse with hot water applied by medium-pressure spray to remove chemicals and soil.
4. Apply acidic afterwash cleaner to stone, while surface is still wet, using low-pressure spray equipment, deep-nap roller or soft-fiber brush. Let neutralizer remain on surface for period recommended by manufacturer unless otherwise indicated.
5. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil.
6. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.

6.1 FIELD QUALITY CONTROL

A. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives to observe progress and quality of portion of the Work completed.

END OF SECTION 04 01 40

SECTION 04 21 13 - BRICK MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete facing brick.
2. Face brick.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Samples: For each type and color of brick and colored mortar.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product indicated.

1.4 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

B. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 24 inches high by full thickness.

1.5 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 CONCRETE BRICK

A. Regional Materials: Concrete brick shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Integral Water Repellent: Provide concrete brick made with liquid polymeric, integral water repellent admixture that does not reduce flexural bond strength.

1. Products: Subject to compliance with requirements

a. ACM Chemistries, Inc.; RainBloc.
b. BASF Aktiengesellschaft; Rheopel Plus.
c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

C. Concrete Facing Brick: ASTM C 1634.

1. Density Classification: Normal weight
2. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
3. Texture: To match existing, Contractor to verify and provide samples

a. Match Architect's samples.

4. Colors: As selected by Architect from manufacturer's full range.

2.3 BRICK

A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. General: Provide shapes indicated and as follows.

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).

1. Products: Subject to compliance with requirements,

2. Grade: SW
3. Type: FBX
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.
7. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

2.4 MORTAR MATERIALS

A. Regional Materials: Aggregate for mortar cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: ASTM C 91.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Capital Materials Corporation; Flamingo Color Masonry Cement.
b. Cemex S.A.B. de C.V.; Brikset Type N.
c. Essroc, Italcementi Group; Brixment.
d. Holcim (US) Inc.; Mortamix Masonry Cement
e. Lafarge North America Inc.; Magnolia Masonry Cement.
f. Lehigh Cement Company; Lehigh Masonry Cement
g. National Cement Company, Inc.; Coosa Masonry Cement.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Davis Colors; True Tone Mortar Colors.
b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
c. Solomon Colors, Inc.; SGS Mortar Colors.

G. Colored Cement Product: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Colored Portland Cement-Lime Mix:

1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
3) Lafarge North America Inc.; Eaglebond Portland & Lime.
4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

b. Colored Masonry Cement:

1) Capital Materials Corporation; Flamingo Color Masonry Cement.
2) Cemex S.A.B. de C.V.; Richcolor Masonry Cement.
3) Essroc, Italcementi Group; Brixment-in-Color.
4) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
5) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
6) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
7) National Cement Company, Inc.; Coosa Masonry Cement.

H. Aggregate for Mortar: ASTM C 144.

1. White-Mortar Aggregates: Natural white sand or crushed white stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ACM Chemistries, Inc.; RainBloc for Mortar.
b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

2.5 REINFORCEMENT

A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

B. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch diameter, hot-dip galvanized, carbon-steel continuous wire.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.
3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.075-inch with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.

E. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

   a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) Dayton Superior Corporation, Dur-O-Wal Division; [D/A 213].
      2) Heckmann Building Products Inc.; 315-D with 316.
      3) Hohmann & Barnard, Inc.; DW-10
      4) Wire-Bond; 1004, Type III.

b. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, having slotted holes for inserting wire tie.
c. Anchor Section: Corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed, washer head that covers hole in sheathing.
d. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick, steel sheet, galvanized after fabrication.
e. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.25-inch diameter, hot-dip galvanized steel wire.

4. Seismic Masonry-Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 213S.
2) Hohmann & Barnard, Inc.; DW-10-X-Seismiclip.
3) Wire-Bond; RJ-711 with Wire-Bond clip.

b. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, having slotted holes for inserting connector section.
c. Connector Section: Rib-stiffened, sheet metal bent plate, sheet metal clip, or wire tie and rigid PVC extrusion designed to engage continuous wire. Size connector to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
d. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch thick, steel sheet, galvanized after fabrication.
e. Fabricate wire connector sections from 0.25-inch diameter, hot-dip galvanized, carbon-steel wire.

5. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
6. Stainless-Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer.

2.7 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual and as follows:

1. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

2. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.

B. Flexible Flashing: Use[one of] the following unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Advanced Building Products Inc.; Copper Fabric Flashing.
2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Fabric Thru-Wall Flashing.
3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
5) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
6) York Manufacturing, Inc.; Multi-Flash 500.

2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Advanced Building Products Inc.; Peel-N-Seal.
2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
4) Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
5) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
6) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
7) Hohmann & Barnard, Inc.; Textroflash.
8) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
9) Polyguard Products, Inc.; Polyguard 300.
10) Sandell Manufacturing Co., Inc.; Sando-Seal.
11) Williams Products, Inc.; Everlastic MF-40.

3. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) DuPont; Thru-Wall Flashing.
2) Hohmann & Barnard, Inc.; Flex-Flash.
3) Hyload, Inc.; Hyload Cloaked Flashing System.
4) Mortar Net USA, Ltd.; Total Flash.

4. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Specialty Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
4) Hohmann & Barnard, Inc.; Epra-Max EPDM Thru-Wall Flashing.
5) Sandell Manufacturing Co., Inc.; EPDM Flashing.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Weep/Vent Products: Use one of the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Advanced Building Products Inc.; Mortar Maze weep vent.
2) Blok-Lok Limited; Cell-Vent.
3) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
4) Heckmann Building Products Inc.; No. 85 Cell Vent.
5) Hohmann & Barnard, Inc.; Quadro-Vent.

6) Wire-Bond; Cell Vent.

2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

3. Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.

a. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1) Hohmann & Barnard, Inc.; #343 Louvered Weep Hole.
2) Williams Products, Inc.; Williams-Goodco Brick Vent.
3) Wire-Bond; Louvered Weepholes.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Advanced Building Products Inc.; Mortar Break.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

2. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep.
b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without

discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.

2.10 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

   1. Do not use calcium chloride in mortar.
   2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type N unless another type is indicated.

D. Pigmented Mortar: Use colored cement product.

   1. Pigments shall not exceed 10 percent of portland cement by weight.
   2. Pigments shall not exceed 5 percent of masonry cement by weight.
   3. Application: Use pigmented mortar for exposed mortar joints.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

   1. Mix to match Architect's sample.
   2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet), 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch; do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.6 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed [tie sections] in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 incch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products or open head joints to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products or open head joints to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

3.9 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes
2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.10 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 21 13

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Steel pipe handrails, balusters, and fittings.

C. Products Supplied But Not Installed Under This Section:

1. Division 03 Section "Cast-In-Place Concrete" (for placement of anchors in concrete).
2. Division 04 Section "Concrete Unit Masonry"

D. Related Sections:

1. Division 01 Section "General Requirements."
2. Division 06 Section "Painting" (for paint finish)

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. ASTM International:

1. ASTM A 53 Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe
2. ASTM A 386 Zinc-Coating (Hot-Dip) on Assembled Steel Products
3. ASTM A 500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
4. ASTM A 501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
5. ASTM B 211 Aluminum-Alloy Bars, Rods, and Wire

6. ASTM B 221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
7. ASTM B 241 Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
8. ASTM B 483 Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications

C. Steel Structures Painting Council (SSPC)

1.3 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements."

B. Submit under provisions of Division 01 Section "General Requirements".

C. Shop drawings shall indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

D. Samples: Submit two (2) samples, of elbow, tee, wall bracket, escutcheon, and end stop.

1.4 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Wagner Collaborative Metal Works Railing Components, Julius Blum & Co. Inc. Pipe Rails, or Equal

2.2 ALUMINUM RAILING SYSTEM

A. Rails: 1-1/2 inch diameter, extruded tubing [conforming to ASTM [B 211] [B 221] [B 241] [B 483]].

B. Posts: 2 x 2-1/2 inch size, extruded tubing [conforming to ASTM [B 211] [B 221] [B 241] [B 483]].

C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined aluminum.

D. Mounting: Demountable brackets and flanges, with steel inserts for casting in concrete. with steel brackets for embedding into masonry. Prepare backing plate for mounting in masonry wall construction.

E. Splice Connectors: Collar with locking set screws; cast aluminum.

F. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

G. Finish: Coated] to specified color.

2.3 STEEL RAILING SYSTEM

A. Rails and Posts: 1 1/2 inch diameter steel pipe; welded joints.

B. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast steel.

C. Mounting: brackets and flanges, with steel inserts for casting in concrete and with steel brackets for embedding in masonry.

D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

E. Splice Connectors: Steel welding collars threaded collars.

F. Shop and Touch-Up Primer: red oxide.

G. Shop Prefinishing: Enameled.

2.4 FABRICATION

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Delete the following paragraph if noted on drawings.

F. Continuously seal joined pieces by continuous welds.

G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Accurately form components to suit stairs and landings, to each other and to building structure.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to the beginning of the installation, the Subcontractor shall assure the University that field conditions are suitable for the installation of handrails and railings.

B. By beginning installation work, the Subcontractor warrants that existing conditions are suitable for installing handrails and railings.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections of this Specification.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors and plates required for connecting railings to structure. Anchor railing to structure.

D. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 05 52 13

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
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Located at:
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NEWARK, DE 19702

PREVAILING WAGES FOR **BUILDING CONSTRUCTION** EFFECTIVE MARCH 15, 2016

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	22.58	27.81	40.47
BOILERMAKERS	67.59	34.29	50.41
BRICKLAYERS	50.49	50.49	50.49
CARPENTERS	52.81	52.81	41.97
CEMENT FINISHERS	70.82	30.05	21.89
ELECTRICAL LINE WORKERS	44.90	38.50	29.36
ELECTRICIANS	65.10	65.10	65.10
ELEVATOR CONSTRUCTORS	83.06	63.69	31.54
GLAZIERS	69.30	69.30	55.95
INSULATORS	54.38	54.38	54.38
IRON WORKERS	61.20	61.20	61.20
LABORERS	43.60	43.60	43.60
MILLWRIGHTS	66.83	66.83	53.40
PAINTERS	46.72	46.72	46.72
PILEDRIVERS	72.97	38.86	31.43
PLASTERERS	29.47	29.47	21.84
PLUMBERS/PIPEFITTERS/STEAMFITTERS	65.95	50.85	55.34
POWER EQUIPMENT OPERATORS	61.36	61.36	43.28
ROOFERS-COMPOSITION	23.49	23.40	20.87
ROOFERS-SHINGLE/SLATE/TILE	18.16	18.07	16.98
SHEET METAL WORKERS	65.14	65.14	65.14
SOFT FLOOR LAYERS	49.77	49.77	49.77
SPRINKLER FITTERS	54.57	54.57	54.57
TERRAZZO/MARBLE/TILE FNRS	55.72	55.72	46.92
TERRAZZO/MARBLE/TILE STRS	63.98	63.98	54.33
TRUCK DRIVERS	28.39	27.10	20.68

CERTIFIED: 4/14/16 BY: _____
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: FD-15-059 DSU Campus Wide ADA Railing and Ramp Modifications , Kent County